

Porta  Billing100[®]

Maintenance Release 10



User Guide, Part II

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**PortaBilling100 User Guide Part II
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Preface

This document provides PortaBilling100 users with the most common examples and guidelines for setting up a VoIP network. The last section of the document answers the most frequent questions users ask after running PortaBilling100 for the first time.

Where to get the latest version of this guide

The hard copy of this guide is updated at major releases only, and does not always contain the latest material on enhancements occurring between minor releases. The online copy of this guide is always up to date, and integrates the latest changes to the product. You can access the latest copy of this guide at www.portaone.com/resources/documentation

Conventions

This publication uses the following conventions:

- Commands and keywords are in **boldface**
- Terminal sessions, console screens and system file names are displayed in `fixed width font`



Caution means ‘reader beware’. You are capable of doing something that might result in a program malfunction or loss of data.

NOTE: Means ‘reader take note’. Notes contain helpful suggestions or references to materials not contained in this manual.

Timesaver means that you can save time by performing the action described in the paragraph.



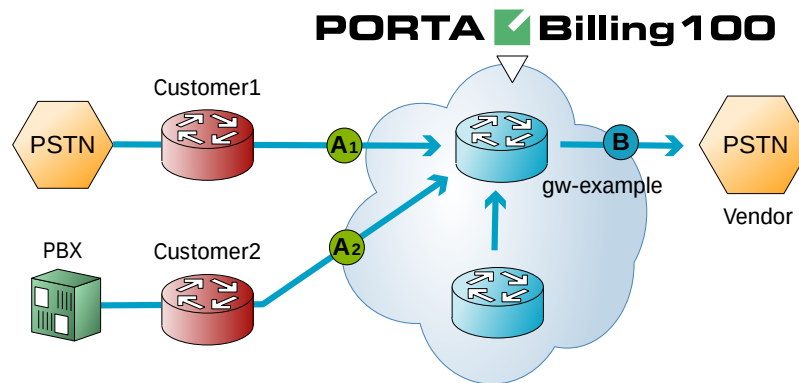
Tips are information that might help you to solve a problem.

4. Setting up a Wholesale IP Telephony Company

Wholesale voice is a growth market, with service providers building new capacities and launching new services. The primary wholesale service is long-distance transport and aggregation, with the key advantage being that country-specific features and domestic calling regulations are not required. The principal beneficiaries are developing countries, where, in many cases, the quality of VoIP is superior to that of traditional PSTN services.

Typical business case

Central to the delivery of wholesale voice services are voice points-of-presence (POPs), which are interconnected to other service providers. The Minutes Aggregation and Resale service (including ASP Termination) allows wholesale network providers to collect traffic from multiple originating providers, then aggregate and deliver it to the termination providers they select.



The provider in this scenario is the owner of termination node (POP) gw-example1. This is a typical example of a VoIP network where customers pay the provider to terminate traffic at point (A_n), while the provider himself pays the vendor for traffic at point (B). The provider makes his profit on the difference between:

- the tariff he charges his customer (A_n), and
- the tariff he is being charged by the vendor (B).

Setting up your network components

Configuring NAS gw-example1

1. Basic router configuration

It is highly recommended to use the latest telephony IOS and DSP firmware, and that the hostname be the same as the h323-id.

```
hostname <h323_id>
ip domain name <default domain>
```

NOTE: VSA h323-gw-id="hostname.domain"

2. NTP

NOTE: It is very important to have reliable time services.

```
ntp server <name/IP>
.....
ntp server <name/IP>
ntp master 5
clock timezone <your time zone> 1
clock summer-time <your summer time zone> recurring <your rules>
```

NOTE: It is important that you only use well-known time zone abbreviations which are supported by the billing engine. If unsure, use the UTC time zone.

3. AAA

```
aaa new-model
aaa authentication login h323 group radius
aaa authorization exec h323 group radius
aaa accounting connection h323 stop-only group radius
```

4. VoIP interface

```
interface <your interface to the world>
h323-gateway voip interface
h323-gateway voip id <gatekeeper id> ipaddr <IP> <port>
h323-gateway voip h323-id <h323_id>
```

NOTE: If you want to use a virtual interface then add the line:

```
h323-gateway voip bind srcaddr <IP>
```

5. Enable gateway functionality

```
gateway
```

6. Enable gateway accounting

For older IOS versions:
gw-accounting h323 vsa
For newer IOS versions (12.2T or 12.3):
gw-accounting aaa
acct-template callhistory-detail

NOTE: VSA does not work for all platforms.

7. Radius

IMPORTANT NOTE: Ports 1645/1646 are the traditional Radius ports used by many vendors without obtaining an official IANA assignment. The official assignment is now ports 1812/1813, and users are encouraged to migrate to these new ports when possible.

Cisco notes:

- “radius-server” commands will be available only after issuing “aaa new-model” command.
- UDP port for RADIUS accounting server - default is 1646 (see note above)
- UDP port for RADIUS authentication server - default is 1645 (see note above)

Keep in mind:

- Default ports for Cisco are 1645/1646
- Defaults in /etc/ services are 1812/1813

```
radius-server host <name/IP> acct-port 1812 auth-port 1813
radius-server key <key>
radius-server vsa send accounting
radius-server vsa send authentication
```

8. voice-card

9. controller

10. voice-port

Depends on your hardware configuration

11. call application voice & dial-peers

```
call application voice remote_ip ftp://.../remote_ip_authenticate.1.1.1.tcl
!
dial-peer voice 10 pots
destination-pattern .
port 0:D
!
dial-peer voice 11 voip
application remote_ip
incoming called-number .
```

NOTE: There is an “Advanced remote authenticate” application available at <http://store.portaone.com>. It contains many extra features beyond the default Cisco application; therefore we recommend using it instead of that application.

Billing configuration

Please see the **PortaBilling Administrator Interface** PDF file for detailed instructions on how to navigate and operate in the web interface and detailed explanations of particular fields.

Initial configuration of PortaBilling

The following steps are normally performed only once, after the system has been installed. This includes:

- Visit **Company Info** from the main menu. Enter information about your company and set up a base currency. Of course this does not limit your operations to this currency only. However, on reports such as cost/revenue different currencies will be converted to the one you specify here.
- From the main menu, choose **Users** and create login entries for users who will be working with the system. It is not recommended that the default PortaBilling root user (**pb-root**) be used for any operations other than initial set-up.
- Make sure you are able to login as the newly-created user and change the password for the **pb-root** user.

NOTE: It is possible that you will require assistance from PortaBilling support personnel in the future. In order to provide support, they will need access to the web interface. Therefore, when you submit a problem report please either provide them with a new password for the **pb-root** user, or create a special user for them.

- If you plan to do billing in more than one currency, define these in **Currencies** and specify the exchange rates in **Exchange Rates**.

Create destinations

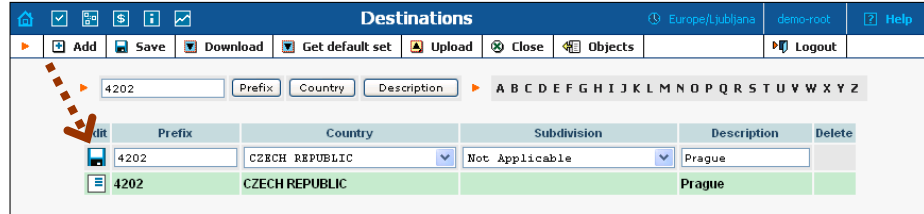
This step is only required if you have not defined the necessary destinations before. There are two ways of entering new destinations into the system:

- One-by-one, using the  **Add** functionality on the web interface
- Bulk update, by uploading destinations from a file

NOTE: A file with the default destination set is supplied with PortaBilling. You can download it and then upload it to the server. However, it may be possible that your business requires different types of prefixes, so please check the data in the file before uploading.

Creating destinations “one-by-one”:

1. In the Management section of Admin-Index, choose **Destinations**.



Prefix	Country	Subdivision	Description	Delete
4202	CZECH REPUBLIC	Not Applicable	Prague	

2. Click on the  **Add** button.
3. Fill in the required information. This includes the phone prefix and country. Country subdivision is optional. You can use the **Description** column to store some extra information about the destination (for example, if it is a mobile or fixed number).
4. Click  **Save**.
5. Repeat steps 2-4 for each additional destination.

Uploading a set of destinations from a file

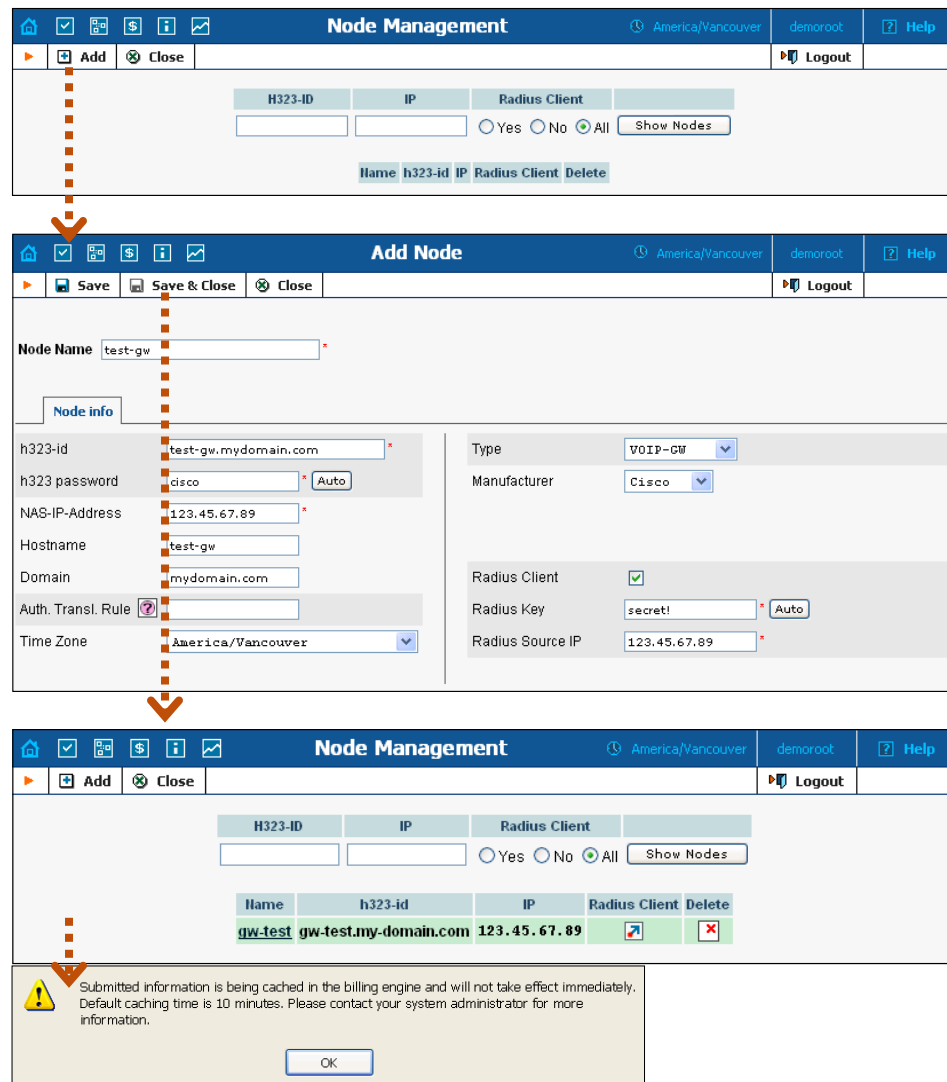
1. In the Management section of Admin-Index, choose **Destinations**.
2. Click on **Get default set** to download a set of destinations as a CSV (Comma-Separated Values) file.
3. Open this file in Microsoft Excel or any other suitable program. Edit the data if required.
4. Save the file and close it in Excel.
5. Switch back to the PortaBilling web interface, and click **Upload** on the Destinations screen.
6. Type in the filename of the file you have edited, or click on the **Browse...** button and select the file.
7. Click  **Save&Close**.

Create Nodes

This step is only required if you have not entered your gateways into the system before. In this case, you must enter your gateways as nodes.

PortaBilling requires some key information about your network equipment such as IP address, h323-id, Radius shared secret, etc.

NOTE: Only your own gateways have to be entered as nodes. Remote gateways which belong to the customer, or ones which legally belong to you but are used solely by your customer(s), are not considered nodes.



The screenshot shows the 'Node Management' interface. At the top, there are navigation icons and a header bar with 'Node Management', 'America/Vancouver', 'demoroot', and 'Help'. Below the header, there are buttons for 'Add' and 'Close'. The main area contains a table with columns 'H323-ID', 'IP', and 'Radius Client'. Below the table, there is a 'Show Nodes' button. A red dashed arrow points from the 'Add' button to the 'Add Node' form.

The 'Add Node' form has a 'Node Name' field with the value 'test-gw'. Below it, there is a 'Node info' section with fields for 'h323-id' (test-gw.mydomain.com), 'h323 password' (cisco), 'NAS-IP-Address' (123.45.67.89), 'Hostname' (test-gw), 'Domain' (mydomain.com), 'Auth. Transl. Rule' (empty), and 'Time Zone' (America/Vancouver). To the right, there is a 'Type' dropdown (VOIP-GW), a 'Manufacturer' dropdown (Cisco), a 'Radius Client' checkbox (checked), a 'Radius Key' field (secret!), and a 'Radius Source IP' field (123.45.67.89). A red dashed arrow points from the 'Add Node' form to the 'Node Management' table.

The 'Node Management' table now shows a new row with the following data:

Name	h323-id	IP	Radius Client	Delete
gw-test	gw-test.my-domain.com	123.45.67.89	☒	

Below the table, there is a warning message: 'Submitted information is being cached in the billing engine and will not take effect immediately. Default caching time is 10 minutes. Please contact your system administrator for more information.' with an 'OK' button.

1. In the Management section of the Admin-Index page, choose **Nodes**.
2. In the Node management window, click the  **Add** icon.
3. Fill in the New Node form:
 - o **Node name** – A short descriptive name for this node (will be used in the select menus).

- o **H323-ID** – h323-id (recommended hostname.domainname)
 - o **H323 Password** – If you plan to use the default Cisco remote IP authentication script, put **cisco** here.
 - o **NAS-IP-Address** – IP address of the gateway.
 - o **Auth. Translation rule** – Use to convert a dialed number to the desired format.
 - o **Type** – VoIP node type; select VOIP-GW.
 - o **Manufacturer** – Select **Cisco** or **Quintum**.
 - o **Radius Client** – Select if this node will be communicating with the billing system.
 - o **Radius Key** – If this node is a radius client, enter the shared secret here; must be the same as that configured in NAS as a **key** in the radius server configuration.
 - o **Radius Source IP** – Unless your gateway has multiple network interfaces, the value here should be the same as NAS-IP-Address.
4. Click  **Save&Close**.
 5. Repeat steps 2-4 until all of your nodes have been entered.

NOTE: There is some propagation delay between the database and the Radius server configuration file, but no more than 15 minutes.

Create Tariff

A tariff is a single price list for call services. A tariff combines:

- conditions which are applicable to every call regardless of the called destination
- per destination rates.

Normally you need a separate tariff for each of your customers.

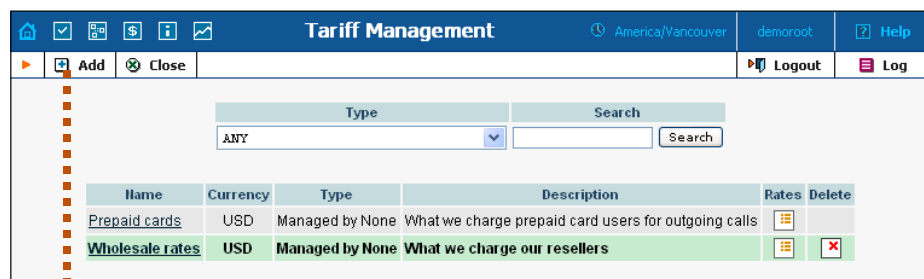
1. In the Management section of Admin-Index, choose **Tariffs**.
2. On the Tariff Management page, choose  **Add**.
3. Fill in the **New Tariff** form:
 - o **Name** – Short name of the tariff object. This is the name you will see later in the select menus.
 - o **Currency** – Indicates in which currency the pricing information is defined. All pricing information for a single tariff must be defined in the same currency.

NOTE: The currency for the tariff is chosen only once, and cannot be changed later.

- o **Type** – If you plan for this tariff to be used for your reseller's accounts, so that the reseller himself can edit rates in this tariff, choose "Managed by NNN", where NNN is the reseller's name. Otherwise, if this tariff is for the retail customer's accounts, or for your termination costs to the vendor, choose **Managed by None** here.
- o **Off-peak Period** – Defines the off-peak period. Click on the Off-peak period wizard icon () to summon the wizard, which

will help you construct the correct period definition. Click **Help** to get more information on period format definition. If you do not differentiate between peak and off-peak rates, just leave this field blank.

- o **Off-Peak Description** – Description of the off-peak period, automatically filled in by the off-peak period wizard. You do not have to fill in this field.
 - o **Destination group set** – If you wish to enter rates in the tariff not for every individual prefix, but for a whole group of prefixes at once, you should create a destination group set and destination groups beforehand. Leave this select menu empty for now.
 - o **Free seconds** – The number of free seconds granted for each call. In order to claim free seconds, the length of the call must be at least one billing unit (first interval; see the ‘Enter Rates’ section above).
 - o **Post Call Surcharge** – Percentage of the amount charged for the call.
 - o **Login Fee** – Amount to be charged immediately after the first user authentication (i.e. after user enters his PIN).
 - o **Connect Fee** – Amount to be charged for each connected call (with a non-zero duration).
 - o **Round charged amount** – Instead of calculating CDRs with a 5-decimal-place precision, round up CDR amount values (e.g. to cents, so that 1.16730 becomes 1.17).
 - o **Formula** – Default rating formula, which will be applied to every rate created in the tariff. If you leave this empty, the “old-style” rating will be used.
 - o **Short Description** – A short tariff description. This will be shown in the rate lookup on the admin interface and the self-care pages for your accounts and customers. For example, for a tariff named cust-ABC-Easy Call-1800, the short description will provide better information for your reseller ABC, who will be using this tariff, such as: EasyCall – via a toll-free number. This field is mandatory; if you are unsure what to enter here, use the same value as for the name of the tariff.
 - o **Description** – Extended tariff description.
4. Click **Save**.



The screenshot shows the 'Tariff Management' interface. At the top, there's a header with navigation icons, the title 'Tariff Management', and user information 'America/Vancouver', 'demoroot', and 'Help'. Below the header is a toolbar with 'Add', 'Close', 'Logout', and 'Log' buttons. The main content area features a search bar with a 'Type' dropdown set to 'ANY' and a 'Search' button. Below the search bar is a table with the following data:

Name	Currency	Type	Description	Rates	Delete
Prepaid cards	USD	Managed by None	What we charge prepaid card users for outgoing calls		
Wholesale rates	USD	Managed by None	What we charge our resellers		

Add Tariff America/Vancouver demoroot Help

Save Save & Close Close Logout Log

Name: Termination services Currency: USD - US Dollar

Type: Managed by None

General Info

Off-Peak Period: TEST

Off-Peak Description:

Destination Group Set:

Free Seconds: 0

Post Call Surcharge: 0 %

Login Fee: 0

Connect Fee: 0

Round Charged Amount: xxxxxx.xxxxxx

Formula:

Short Description: Termination services

Description: What we charge our customers for calls they terminate on our network

Edit 'Termination services' Tariff America/Vancouver demoroot Help

Save Save & Close Close Download Upload Rates Test Logout Log

Name: Termination services Currency: USD

Managed by: None

General Info Web Upload & Download Email Upload Notepad

Off-Peak Period: TEST

Off-Peak Description:

Destination Group Set:

Free Seconds: 0

Post Call Surcharge: 0.00000 %

Login Fee: 0.00000 USD

Connect Fee: 0.00000 USD

Round Charged Amount: xxxxxx.xxxxxx

Formula:

Short Description: Termination services

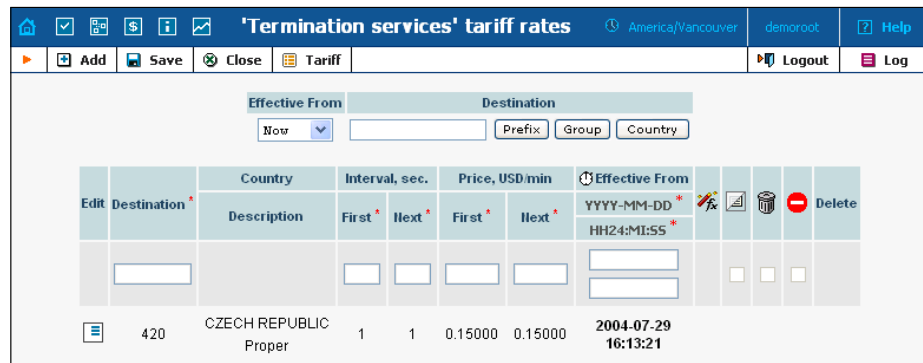
Description: What we charge our customers for calls they terminate on our network

'Termination services' tariff rates America/Vancouver demoroot Help

Add Save Close Tariff Logout Log

Effective From: Now Destination: Prefix: Group: Country:

Edit	Destination	Country	Interval, sec.		Price, USD min		Effective From	Delete
			First	Next	First	Next		
	420	CZECH REPUBLIC Proper	1	1	0.15	0.15	Immediately	



Edit	Destination *	Country	Description	Interval, sec.	Price, USD min	Effective From				Delete
				First *	Next *	First *	Next *	YYYY-MM-DD *	HH24:MI:SS *	
	420	CZECH REPUBLIC	Proper	1	1	0.15000	0.15000	2004-07-29	16:13:21	

Enter Rates

Rates are per-destination prices. Please refer to the **System Concepts** chapter for more details on billing parameters.

Managing rates online

Managing rates online is very convenient for maintaining existing rate tables and for reference purposes. In the case of new price lists or major updates, the offline method is better.

1. On the Tariff Management page you will see a list of available tariffs. Click the  **Rates** icon next to the name of the tariff. When you are in Tariff Management for a particular tariff, click on  **Rates** in the toolbar.
2. In the **Edit Rates** screen click  **Add**.
3. Fill in the required information:
 - o **Destination** – Destination prefix may be entered directly, e.g. **47** for Norway, or you can access the destinations directory by clicking the **Destination** link (in the column header). Here you can find the desired prefix by country name.

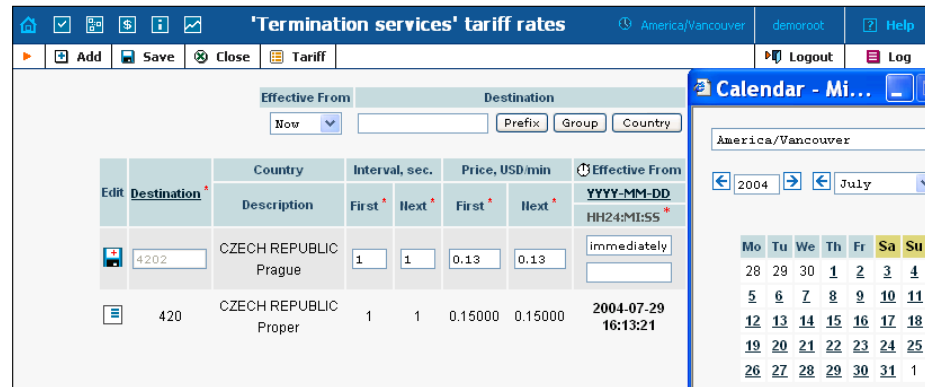
NOTE: The phone prefix you are trying to create a rate for must already exist in Destinations.

- o **Interval First** – first billing unit in seconds
- o **Interval Next** – next billing unit in seconds
- o **Price First** – per-minute price for first interval
- o **Price Next** – per-minute price for next interval
- o **Off-peak Interval First**– first billing unit in seconds for off-peak time
- o **Off-peak Interval Next** – next billing unit in seconds for off-peak time
- o **Off-peak Price First** – per-minute price for first interval for off-peak time
- o **Off-peak Price Next** – per-minute price for next interval for off-peak time

NOTE: Off-peak fields appear only if an **off-peak period** has been defined for the tariff.

- **Formula**  – launches the wizard for creating a custom rating formula
- **Effective from** – If you want this rate to take effect sometime in the future, you can either type a date manually, or use the calendar (click on the DD-MM-YYYY link). Click on the  Stop Watch icon to make the rate effective **immediately**.

NOTE: When using the calendar, you can specify that the date you are entering is in a different time zone than your current one. PortaBilling will then automatically adjust the time.



Edit	Destination	Country	Description	Interval, sec.		Price, USD/min		Effective From
				First	Next	First	Next	YYYY-MM-DD HH24:MI:SS
	4202	CZECH REPUBLIC	Prague	1	1	0.13	0.13	immediately
	420	CZECH REPUBLIC	Proper	1	1	0.15000	0.15000	2004-07-29 16:13:21

- **Hidden, Forbidden or Discontinued** flags are optional
4. Click the  **Save** button in the toolbar, or the  icon on the left end of the row.
 5. Repeat if you need to enter more rates.

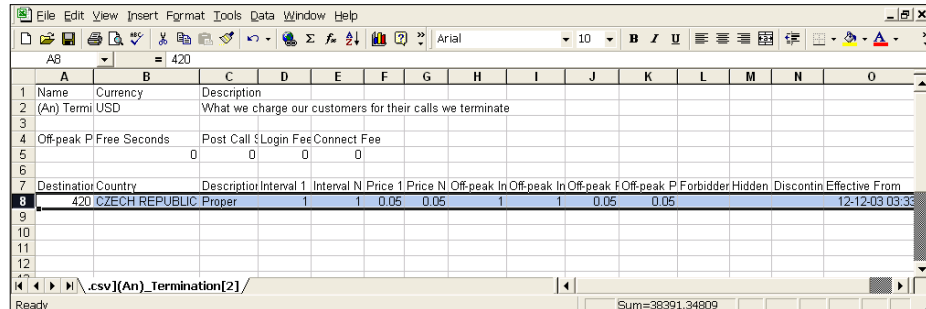
Managing rates offline

NOTE: Templates are available in PortaBilling – a powerful tool for uploading rates from custom format data files. However, in this particular example we assume that you are preparing data in the default PortaBilling format.

The rates table may be prepared using a spreadsheet processor (i.e. Microsoft Excel) and easily imported into PortaBilling. This is very convenient if you wish to make many changes. For example, you might increase all prices by 10%.

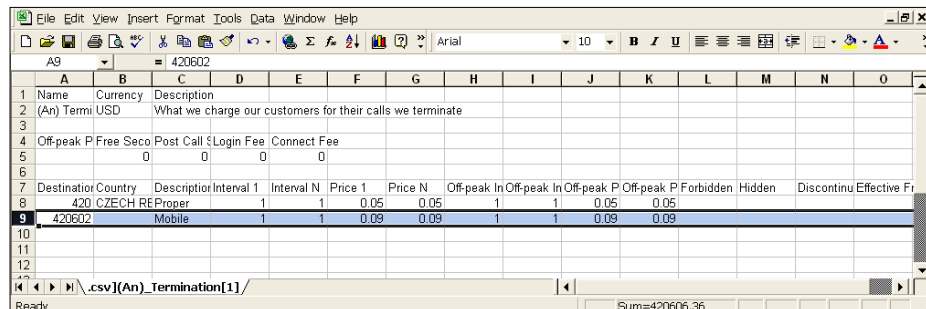
1. If you are not in Tariff Management for your tariff, go to the main menu, click on **Tariffs**, and then click on the tariff name.
2. In the Edit Tariff window, move the mouse over the **Download** button and hold it there until a popup menu appears. Choose the **Now** menu item and click on it. This will download the current set of rates (empty), and will also provide you with an overview of the file structure.

3. You will see the **File download** dialog and be prompted to save the file or open it from its current location. We recommend that you first save the file into a folder you will be using to store tariff data files in the future, then open it in Excel.
4. You should see something similar to the screenshot below:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Name	Currency	Description												
2	(An) Termini	USD	What we charge our customers for their calls we terminate												
3															
4	Off-peak P	Free Seconds	Post Call	Login Fee	Connect Fee										
5		0	0	0	0										
6															
7	Destination Country	Description	Interval 1	Interval N	Price 1	Price N	Off-peak	In Off-peak	In Off-peak	In Off-peak	P Off-peak	P Forbidden	Hidden	Discontin	Effective From
8	420	CZECH REPUBLIC	Proper	1	1	0.05	0.05	1	1	0.05	0.05				12-12-03 03:35
9															
10															
11															
12															

5. Edit the file by adding more rows with rate data, so that it looks similar to the screenshot below.
6. Note that the columns **Country** and **Description** are only for reference purposes, and are ignored during the import. Also, when using the default template you must fill in the data in the Offpeak columns even if your tariff does not have an off-peak period (use the clipboard to easily copy values for the 4 peak columns).
7. Also note that you may use only those phone prefixes which you have already defined as destinations (see **Create destinations** above).



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Name	Currency	Description												
2	(An) Termini	USD	What we charge our customers for their calls we terminate												
3															
4	Off-peak P	Free Seco	Post Call	Login Fee	Connect Fee										
5		0	0	0	0										
6															
7	Destination Country	Description	Interval 1	Interval N	Price 1	Price N	Off-peak	In Off-peak	In Off-peak	In Off-peak	P Off-peak	P Forbidden	Hidden	Discontin	Effective Fr
8	420	CZECH REP	Proper	1	1	0.05	0.05	1	1	0.05	0.05				
9	420602	Mobile	1	1	0.09	0.09	1	1	0.09	0.09					
10															
11															
12															



8. Save the file in Excel. You will probably get a warning from Excel that your file “*may contain features that are not compatible with CSV (Comma delimited)*”. Ignore this, and choose **Yes** to retain CSV format.
9. Close the file in Excel. If you performed step 6, then disregard the message “*Do you want to save the changes you made?*”, as this is only caused by the fact that your format is not the native Excel XLS format.
10. Go back to the PortaBilling web interface and the **Edit Tariff** screen.
11. Click on the **Upload** button.
12. Either enter the name of your file manually, or click **Browse...** and choose the file.
13. Click  **Save&Close**. You should return to the **Edit Tariff** screen, where a message will inform you of the status of the import. Also, you will receive email confirmation about the tariff upload. If any

operation has failed, you will receive that portion of data which was not uploaded as an attachment, so you can try to import it later. You can verify your work using the **Edit Rates** feature. After you have done so, go to the **Main menu** (by clicking on the **Home** icon).

Create all required tariffs



Repeat the **Create Tariff** and **Enter Rates** steps until you have created:

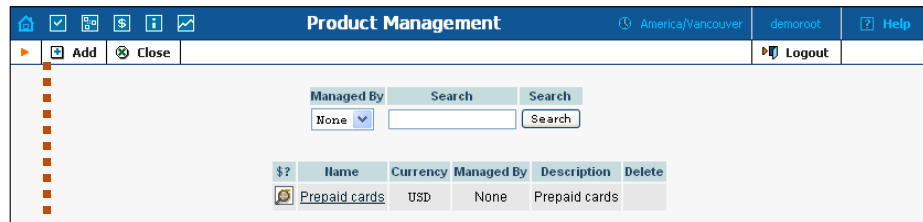
- A tariff for each account's billing scheme. For example, if you plan to charge your customers more when they access toll-free lines instead of local ones, you need two tariffs, i.e. "Normal" and "Using Toll-free line".
- A tariff with the termination costs for each termination partner you have.
- If you have resellers, also create tariffs that you will use for charging each of them. Do not create tariffs which will be applied to your resellers' subscribers yet. First create customers and then return to this step. Make sure that, when creating these subscriber tariffs, you choose *Managed by NNN* in the **Type** menu, where *NNN* is the name of the corresponding reseller

Create Product

Each of the remote customer gateways will be represented as an account and billed accordingly. Hence we need to create a product for this account in order to have a defined way of billing it. If you have per-customer specific rates/tariffs, then you will need a product for each customer.

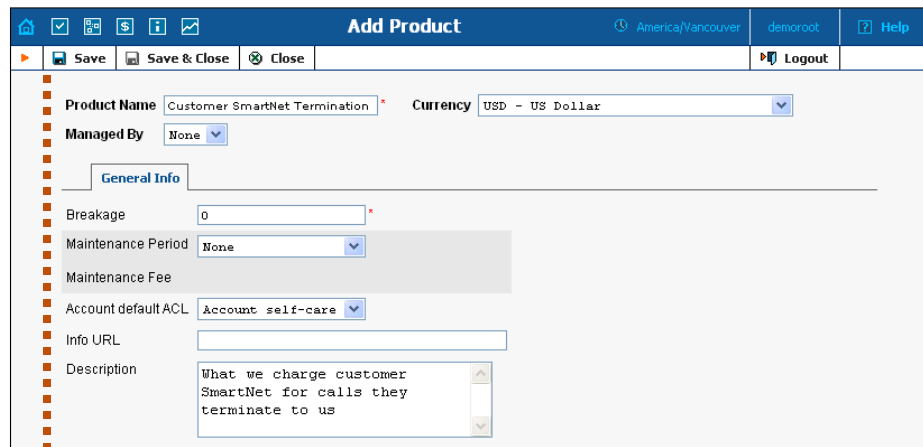
1. In the Management section of the Admin-Index page, choose **Products**.
2. On the Product management page, click the  **Add** icon.
3. Fill in the "Add product" form:
 - o **Product name** – Product object name.
 - o **Currency** – Product currency. Only tariffs which have the same currency will be permitted in the accessibility list.
 - o **Managed by** – If you plan for this product to be used for your reseller's accounts, so that the reseller himself can change the parameters of this tariff and create new accounts with this product, choose the customer's name from the menu. Otherwise choose **None** here.
 - o **Breakage** – Leftover balance which is considered "useless" (for statistical purposes). Accounts with a balance below breakage will be counted as *depleted*. This does not affect account authentication or authorization, so the account can still make calls if there is enough money left to cover at least the first interval.
 - o **Maintenance period** – Surcharge application interval; will be reflected in call history as a separate line each time when charged.

- 0 **Maintenance fee** – Surcharge amount.
 - 0 **Account default ACL** – The access level assigned by default to new accounts created with this product. The ACL determines which operations may be performed by accounts on the self-care pages. The default value is “Account self-care” (pre-defined ACL), which allows all possible operations.
 - 0 **Description** – Your description of the intended use of this product.
4. Click  **Save**.
- Click on the **Accessibility** tab to edit this product’s accessibility.



Managed By	Search	Search
None		Search

?	Name	Currency	Managed By	Description	Delete
	Prepaid cards	USD	None	Prepaid cards	



Product Name Customer SmartNet Termination * **Currency** USD - US Dollar

Managed By None

General Info

Breakage *

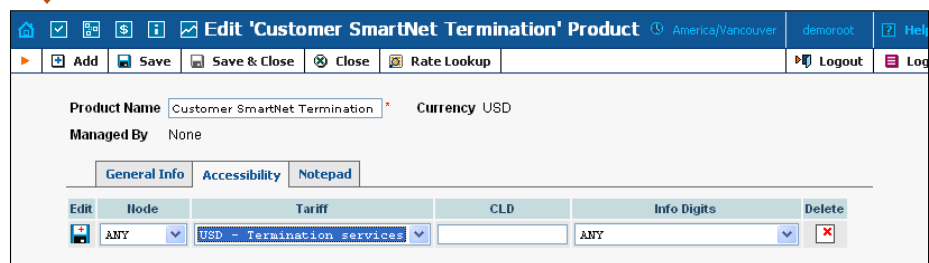
Maintenance Period

Maintenance Fee

Account default ACL

Info URL

Description



Product Name Customer SmartNet Termination * **Currency** USD

Managed By None

General Info **Accessibility** **Notepad**

Edit	Node	Tariff	CLD	Info Digits	Delete
	ANY	USD - Termination services		ANY	

Enter Node and Tariff into the product’s accessibility list

For incoming VoIP traffic we normally do not really need different accessibility entries, as just one row with **ANY** node and tariff should be enough. However, if, for example, you want to let a customer send traffic

to your gateway A but not gateway B, this can be achieved by using accessibility entries.

1. When the Accessibility tab is selected, click on the  **Add** icon.
2. Choose **ANY** as node, choose the tariff with which you want to bill your customer, and leave the CLD field empty.
3. Click **Save** to save this accessibility entry.

Create Vendors

This step is only required if you have not entered information about your vendors into the system before. Vendors are your termination partners or the providers of incoming toll-free lines.

1. In the Management section of the Admin interface, choose **Vendors**.
2. On the Vendor Management page, choose  **Add**.
3. Fill in the **New Vendor** form. Please note that there are two tabs available on the screen. The most important fields are:

Main form (top)

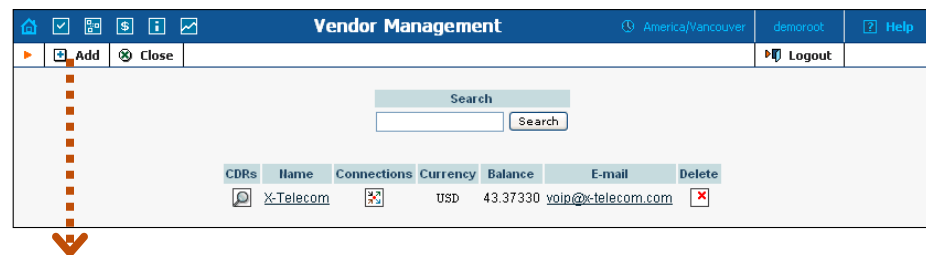
- o **Vendor Name** – Short name for the vendor object; will be used on the web interface.
- o **Currency** – The currency in which this vendor charges you.
- o **Opening balance** – Starting balance for the vendor; default is zero.

Additional info

- o **Billing period** – Split period for vendor statistics.

User-Interface

- o **Time zone** – The time zone which the vendor uses for his billing period. Statistics will be divided into periods according to this time zone.
4. Click  **Save&Close**.
 5. Repeat steps 2-4 to add all of your vendors.



Add Vendor America/Vancouver demoroot Help

Save **Save & Close** **Close** **Logout**

Vendor Name SPT Telecom **Currency** USD - US Dollar
Opening Balance 0

Address Info **Additional Info** **User Interface**

Company Name SPT Telecom **Contact**
Mr./Ms./... **Phone** +420 2 24010100
First Name **M.I.** **Fax**
Last Name **Alt Phone**
Address V Celnici 10 **Alt Contact**
Province/State **E-mail** billing@spt.cz
Postal Code 11721 **BCC**
City Prague **Summary Only**
Country/Region Czech Republic **Description**

Add Vendor America/Vancouver demoroot Help

Save **Save & Close** **Close** **Logout**

Vendor Name SPT Telecom **Currency** USD - US Dollar
Opening Balance 0

Address Info **Additional Info** **User Interface**

Categorizing and Defaults

Billing Period Daily

Add Vendor America/Vancouver demoroot Help

Save **Save & Close** **Close** **Logout**

Vendor Name SPT Telecom **Currency** USD - US Dollar
Opening Balance 0

Address Info **Additional Info** **User Interface**

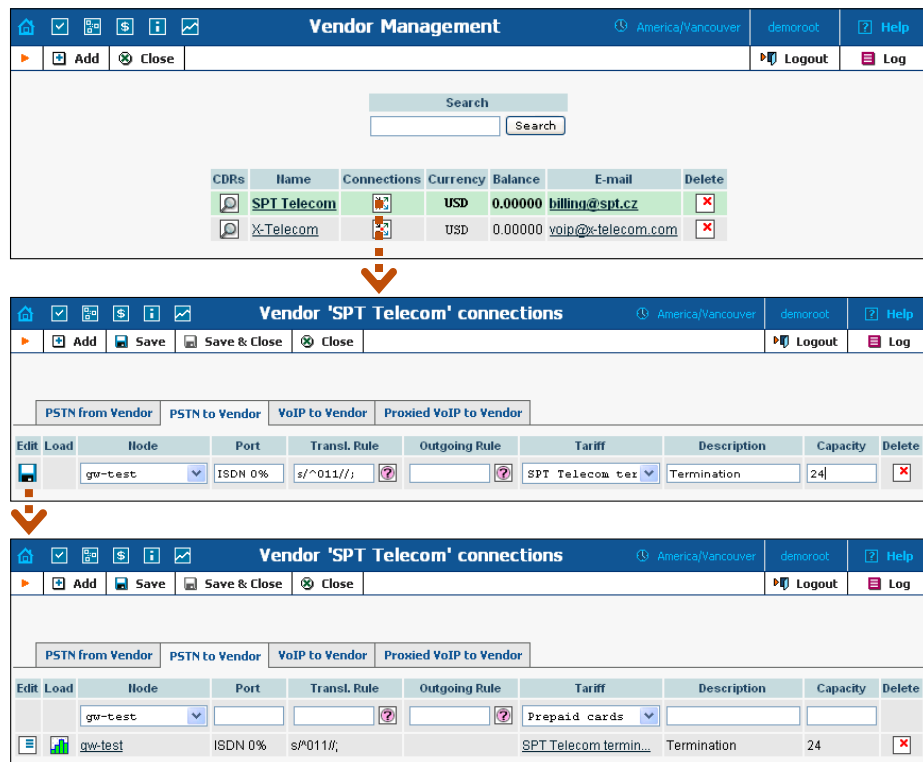
Login **Time Zone** Europe/Prague
Password **Web Interface Language** cs - Czech
Access Level Vendor

Output Format

Date YYYY-MM-DD 2003-12-31
Time HH24:MI:SS User Defined
Date & Time YYYY-MM-DD HH24:MI:SS User Defined

Input Format

Date YYYY-MM-DD 2003-12-31
Time HH24:MI:SS User Defined



The screenshot shows the Vendor Management interface. The top section displays a list of vendors with columns: CDRs, Name, Connections, Currency, Balance, E-mail, and Delete. Two vendors are listed: SPT Telecom and X-Telecom.

Below the vendor list, the 'Vendor 'SPT Telecom' connections' screen is shown. It has tabs for PSTN from Vendor, PSTN to Vendor, VoIP to Vendor, and Proxied VoIP to Vendor. The 'PSTN to Vendor' tab is selected. The table below shows connection details:

Edit	Load	Node	Port	Transl. Rule	Outgoing Rule	Tariff	Description	Capacity	Delete
		gw-test	ISDN 0%	s/^011/;/		SPT Telecom ter	Termination	24	

Below this, the 'Vendor 'SPT Telecom' connections' screen is shown again, but with the 'VoIP to Vendor' tab selected. The table below shows connection details:

Edit	Load	Node	Port	Transl. Rule	Outgoing Rule	Tariff	Description	Capacity	Delete
		gw-test				Prepaid cards			

Define connections

This step is only required if you have not entered information about your vendors into the system before. Vendors are your termination partners or the providers of incoming toll-free lines.

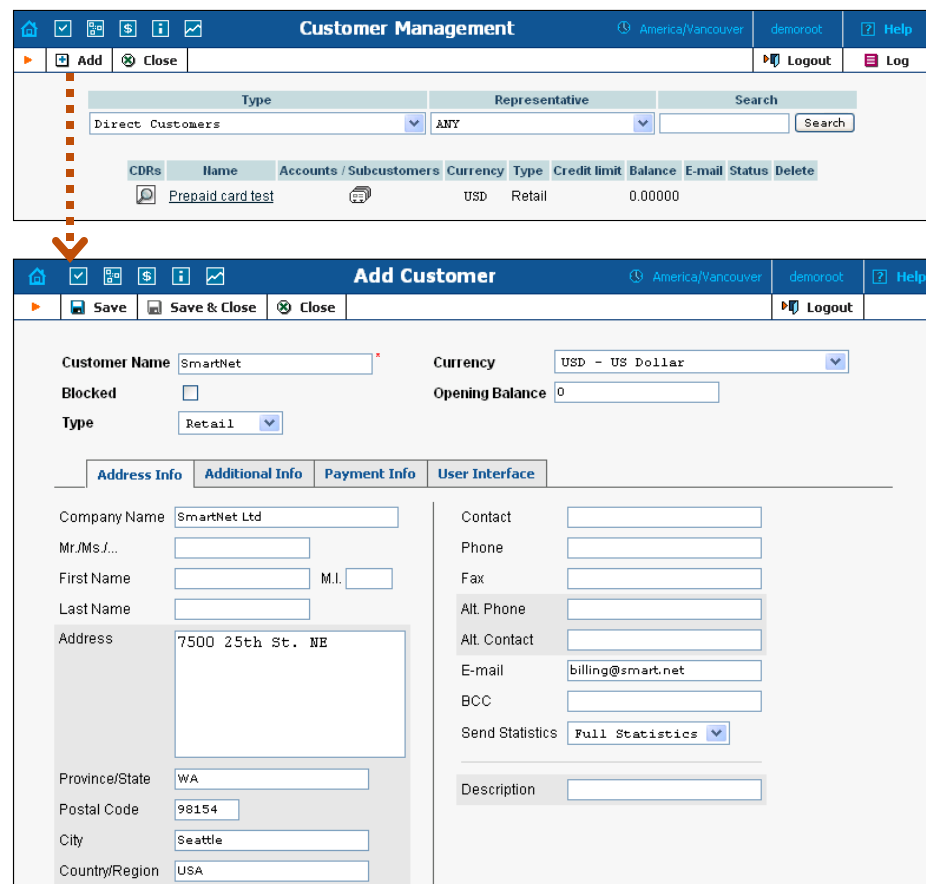
1. In the Management section of the Admin interface, choose **Vendors**.
2. Click on the **Connections** icon next to the vendor name.
3. Choose the connection type **PSTN to Vendor**, **VoIP to Vendor**, etc., by clicking on the corresponding tab.
4. Press **Add** to add a new connection.
5. Fill in the connection information. If you send traffic to the vendor via telephony, choose the node and enter an optional port pattern. If you send traffic via VoIP, enter the remote IP address. Choose the tariff which defines your termination costs for this connection/vendor. **Description** and **Capacity** are mandatory for all connection types.
6. The **translation rule** is necessary if you send calls to the vendor in a format different from the one you use (e.g. the number 420296111222 is sent to the vendor as 004202111222), so that you can convert the phone number to the correct format. **Outgoing rule** is only present if PortaSIP is installed, and is used to convert the number into the vendor-specific format.
7. Click **Save**.
8. Repeat steps 3-5 to add more connections to the same vendor, then click **Close** in order to exit to the **Vendor Management** screen.

9. Repeat steps 2-7 to add connections for other vendors.

Create a Customer

A customer is an owner of accounts. The customer's contact information is used to distribute generated account data and account usage information.

1. In the Management section of Admin-Index, choose **Customers**.
2. On the Customer Management page, choose  **Add**.
3. Fill in the **New Customer** form. Please note that there are several tabs with extra information available on the screen. The most important fields are:



Customer Management America/Vancouver demoroot Help

Add Close Logout Log

Type	Representative	Search
Direct Customers	ANY	Search

CDRs	Name	Accounts / Subcustomers	Currency	Type	Credit limit	Balance	E-mail	Status	Delete
	Prepaid card test		USD	Retail		0.00000			

Add Customer America/Vancouver demoroot Help

Save Save & Close Close Logout

Customer Name SmartNet * Currency USD - US Dollar

Blocked ☐ Opening Balance 0

Type Retail

Address Info Additional Info Payment Info User Interface

Company Name SmartNet Ltd

Mr./Ms./...

First Name M.I.

Last Name

Address 7500 25th St. NE

Province/State WA

Postal Code 98154

City Seattle

Country/Region USA

Contact

Phone

Fax

Alt. Phone

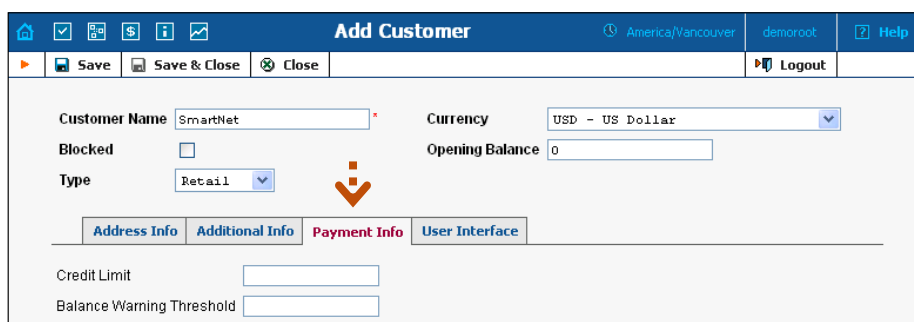
Alt. Contact

E-mail billing@smart.net

BCC

Send Statistics Full Statistics

Description



Add Customer America/Vancouver demoroot Help

Save Save & Close Close Logout

Customer Name SmartNet Currency USD - US Dollar

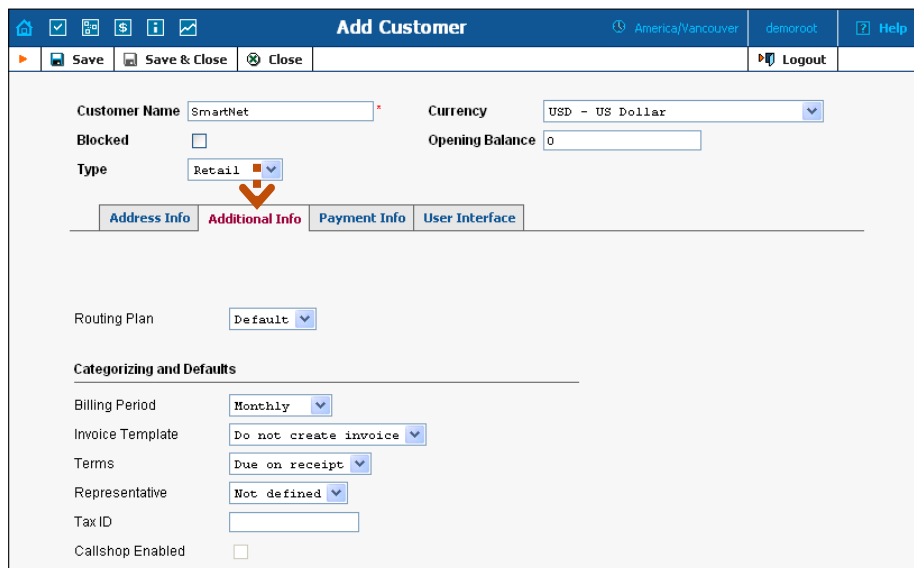
Blocked ☐ Opening Balance 0

Type Retail

Address Info Additional Info Payment Info User Interface

Credit Limit

Balance Warning Threshold



Add Customer America/Vancouver demoroot Help

Save Save & Close Close Logout

Customer Name SmartNet Currency USD - US Dollar

Blocked ☐ Opening Balance 0

Type Retail

Address Info Additional Info Payment Info User Interface

Routing Plan Default

Categorizing and Defaults

Billing Period Monthly

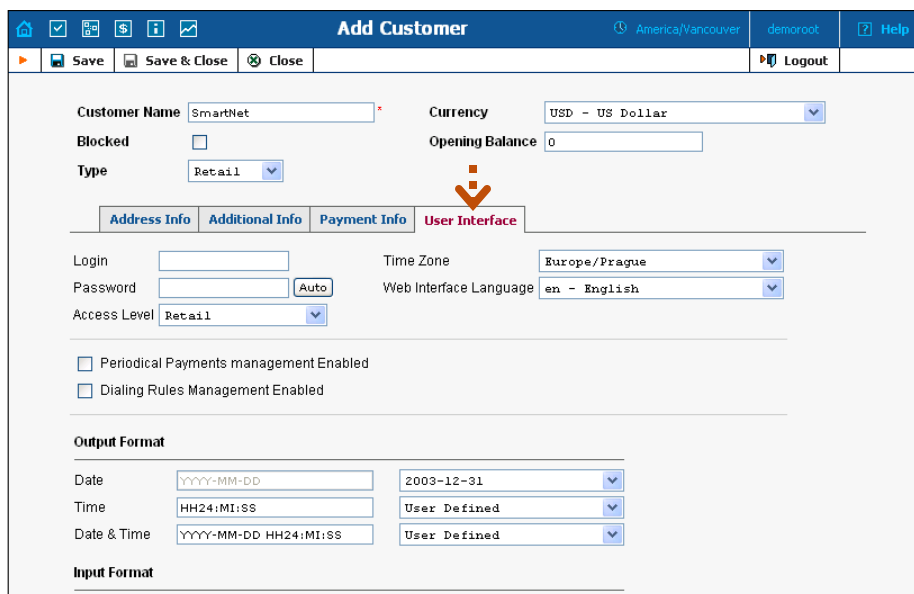
Invoice Template Do not create invoice

Terms Due on receipt

Representative Not defined

Tax ID

Callshop Enabled ☐



Add Customer America/Vancouver demoroot Help

Save Save & Close Close Logout

Customer Name SmartNet Currency USD - US Dollar

Blocked ☐ Opening Balance 0

Type Retail

Address Info Additional Info Payment Info User Interface

Login Password Auto Access Level Retail

Time Zone Europe/Prague Web Interface Language en - English

☐ Periodical Payments management Enabled

☐ Dialing Rules Management Enabled

Output Format

Date YYYY-MM-DD 2003-12-31

Time HH24:MI:SS User Defined

Date & Time YYYY-MM-DD HH24:MI:SS User Defined

Input Format

Main form (top)

- 0 **Name** – Short name for the customer object; will be used on the web interface.

- o **Currency** – The currency in which this customer will be billed.
- o **Opening balance** – Starting balance for the customer; default is zero.
- o **Type** – Choose if this is a reseller or retail (direct) customer. (Normally, most of your customers would be retail customers. Only if a customer is reselling your services, while you are providing services and billing to his subscribers, would he be created as a reseller.)

Address info tab

- o **Email** – Email address for distribution of accounting information. After the billing period is over, a list of CDRs and other statistics will be sent to this address.
- o **Bcc** – Blind carbon copy in email; may be used for debug and archiving purposes.
- o **Summary only** – Distribute summary only, do not attach details file; might be useful when the amount of calls is very large.

Additional info tab

- o **Billing period** – Frequency of accounting information distribution. Available billing periods:
 - **Daily** – One day, midnight to midnight, sent on the next day.
 - **Weekly** – [Mon-Sun] inclusive sent on Monday.
 - **Bi-weekly** – [1-15] inclusive; sent on the 16th day and [16-last day] inclusive – sent on the 1st day.
 - **Monthly** – [1-last day] inclusive; sent on the 1st of the next month.

Payment info tab

- o **Credit limit** – If left empty, there is no credit limit for this customer.
- o **Balance Warning Threshold** – Customer can be notified by email when his balance is dangerously close to the credit limit and his service will soon be blocked. Here you can enter the value for the warning threshold as follows:
 - As a percentage (e.g. 90%). A warning will be sent when the customer's balance exceeds this percentage of his credit limit. Thus, if his credit limit is \$1000.00 and the threshold is 90%, a warning will be sent as soon as the balance is over \$900.00. This is only applicable when the customer has a positive credit limit.
 - As an absolute value. A warning will be sent as soon as the balance exceeds the specified value.

User Interface

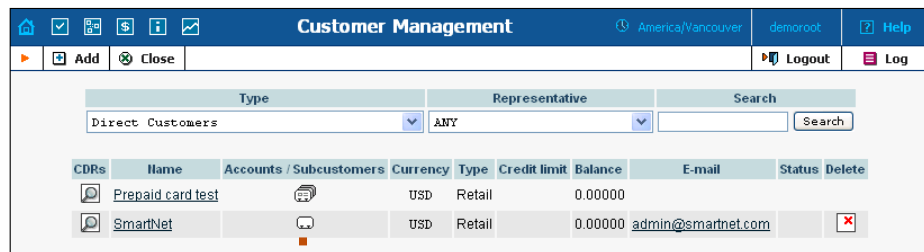
- **Time zone** – This parameter serves two purposes. First of all, it defines in which time zone the customer will see his CDRs. It also defines which time zone will be used to divide the customer's billing periods. For example, if you choose America/New York with a monthly billing period here, the customer's invoice will cover the period starting at 00:00 EST on the 1st of every month.
- **Web Interface Language** – The language to be used on the customer self-care web interface.

Click  **Save&Close** to save your work. See the [PortaBilling Administrator Interface](#) for more information.

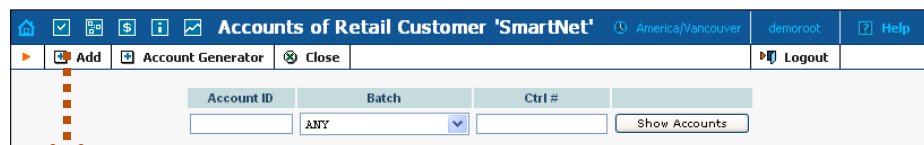
Create Accounts

NOTE: Before generating accounts for a production system, read the section on "Provisioning prepaid accounts".

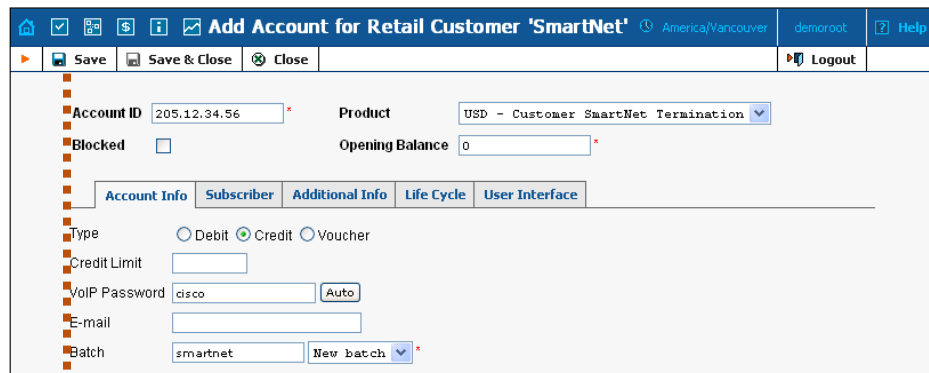
1. Go to the **Customers** screen (the screen which contains a list of customers). It should look like the screenshot below:
2. Next to the customer name, click on the  icon (the one in the **Accounts** column), which will take you to the account management for that customer.



CDRs	Name	Accounts / Subcustomers	Currency	Type	Credit limit	Balance	E-mail	Status	Delete
	Prepaid card test		USD	Retail		0.00000			
	SmartNet		USD	Retail		0.00000	admin@smartnet.com		



Account ID	Batch	Ctrl #
	ANY	



Account ID	Product	Blocked	Opening Balance
205.12.34.56	USD - Customer SmartNet Termination	☐	0

Type	Credit Limit	VoIP Password	E-mail	Batch
☐ Debit ☒ Credit ☐ Voucher		disco		smartnet

Accounts of Retail Customer 'SmartNet'										America/Vancouver		demoroot		Help	
Add		Account Generator		Close								Logout			
Account ID		Batch		Ctrl #								Show Accounts			
		ANY													
CDRs	Account ID	Idle, days	Currency	Balance	Open. Balance	Credit Limit	Type	Product		Batch	Status				
	205.12.34.56		USD	0.00000	0.00000		Credit	Customer SmartNet termination		smartnet-ip					

3. Now click on  **Add**.
4. Fill in the “Add account” form:
 - o **Account ID** – Identification of the account (value to be sent in the **User-Name** attribute). For an account which represents a remote gateway, this is normally an IP address.
 - o **Product** – Choose the product which you would like your accounts to use.
 - o **Blocked** – Check this if you want to create the account as initially blocked.
 - o **Opening balance** – The initial balance on the card. For credit accounts, the opening balance is normally zero.

Account info tab:

- o **Account type** – Account type; select credit.
- o **Credit limit** – Maximum allowed credit.
- o **VoIP Password** – Password for authentication/authorization. If you are using the default Cisco remote_ip_authenticate script, put **cisco** here.
- o **Batch** – A batch is a management unit for accounts. The batch name is alphanumeric. You can type a new name here, or use the existing name in order to generate more accounts for the same batch.

Additional Info tab:

- o **Preferred language** – This is a custom attribute which is transferred to the IVR. Leave English here if you are not sure whether your IVR supports it.
- o **Redirect number** – Redirect number (discussed in the **Advanced features** section); leave this empty.

Life Cycle tab:

- o **Activation date** – Account activation date.
- o **Expiration date** – Account expiration date.
- o **Lifetime** – Relative expiration date; account will expire on “first usage date” + “lifetime” days. If you do not want to use this feature, leave the field blank.

User Interface tab:

- o **Login** – The login name this account will use to access the self-care pages. This can be the same as the account ID, or a different one may be chosen for increased security. This field is mandatory.
 - o **Password** – Password for the self-care pages.
 - o **Time zone** – When an account owner accesses the web self-care pages to see a list of his calls, the time will be shown in the time zone most appropriate for him.
 - o **Web Interface Language** – The language to be used on the customer self-care web interface.
5. Click  **Save&Close**; a confirmation screen will indicate that the account has been created.
 6. Repeat steps 3-5 if the customer has more than one remote gateway.

5. Statistics and Monitoring Tools

Billing server health monitoring

Entire system load

These statistics are accessible from the main admin menu via the **System load** link in the **Statistics** section.

This graph shows the number of calls registered by a production system every 15 minutes: normal calls with duration >0 (green areas) and calls with zero duration (red line). The most recent information appearing on the right-hand side of the graph is an hour old or less.

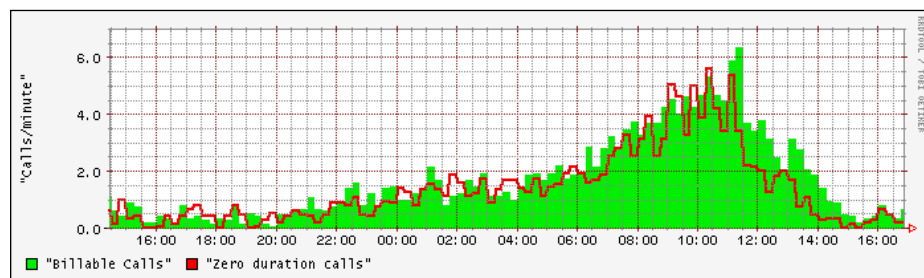


Figure 5-1

Number of calls

If the disconnect time on the CDR does not fall within the past 15 minutes, the call may not be finished, and hence will not be reflected on the graph. (See picture below, call types 3 and 4.)

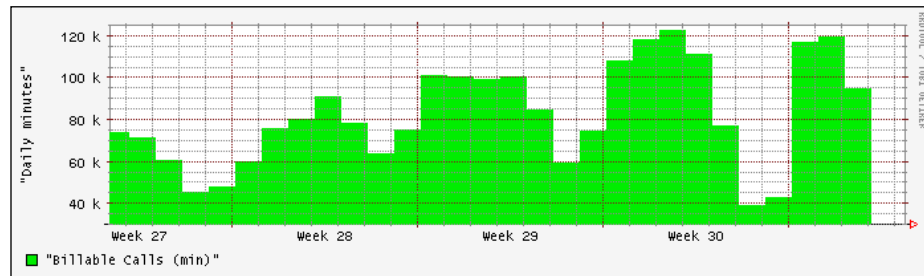
Zero duration calls

The graph can also show possible problems in the system, such as an unexpectedly high number of failed calls.

By default, this graph displays statistics for the last 30 hours.

Total minutes statistics

The graph below gives you the ability to monitor how the call volume in your system changes each day.



Master and slave MySQL server statistics

These statistics are accessible from the main admin menu via the **Database** link in the **Statistics** section.

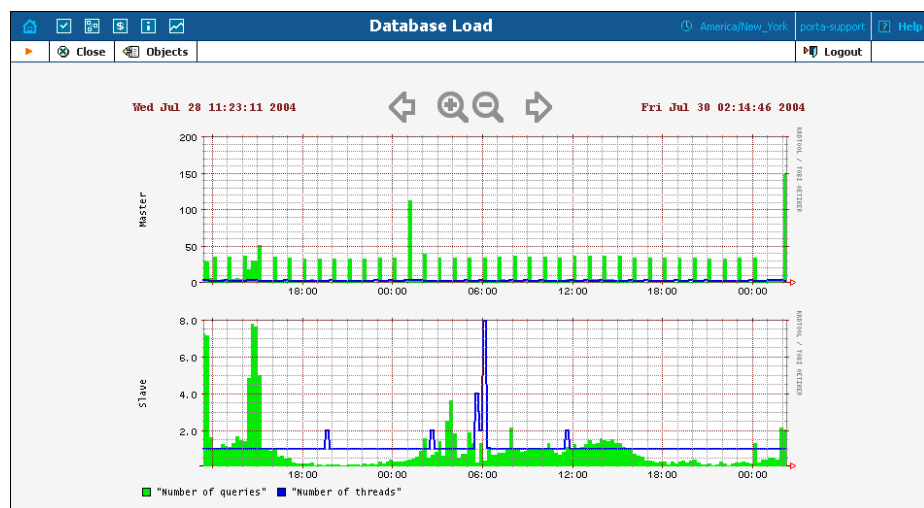


Figure 5-2

These two graphs show values for the status of the MySQL servers. The green line indicates the number of queries processed by the server every 15 minutes, while the blue one shows the number of threads running on the server.

Queries

The graph indicates how many times clients have queried the database. On recommended hardware, this value may exceed 200 without any difficulties. High peaks with a number of requests over 2,000 could indicate improper configuration of the system or temporary problems. Also, these peaks can appear when replication has been restored after a system fault.

Threads

Normal values for these graphs are:

- for the Master server: ≤ 2
- for the Slave server: ≥ 1 and ≤ 3

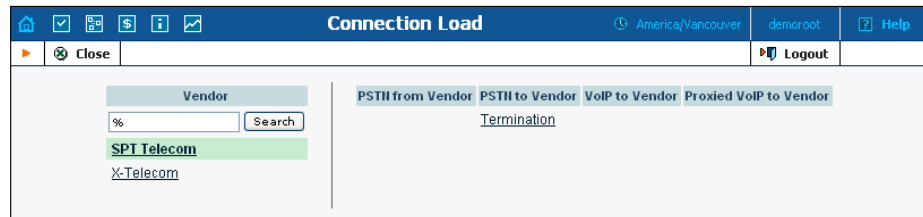
Normally, these values will depend on the processes running on the server, such as the Radius daemon, the Apache httpd server, statistics collection tools, and so on.

Larger values can indicate other client connections to the server. If the number of threads on the slave name server is 0, this means the replication process is down and requires administrator attention (see section 2.4 for details).

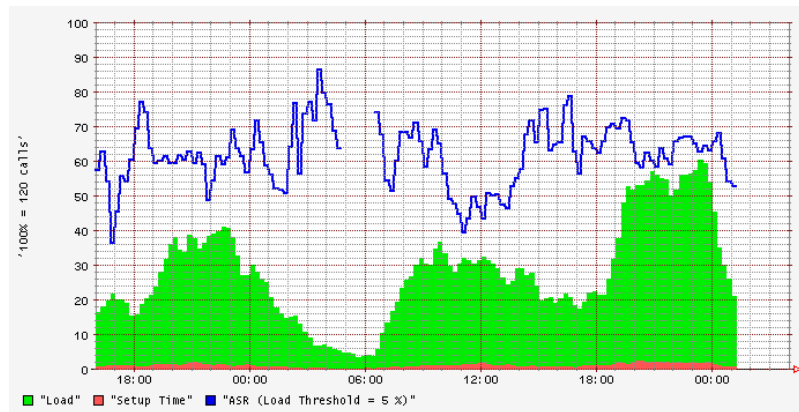
VoIP network performance statistics

Connection load

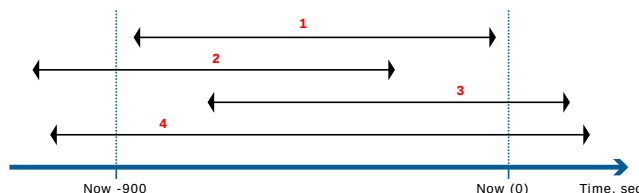
You can monitor load and quality parameters for individual connections. To see a list of the available connections, follow the **Connections** link from the **Statistics** section in the main menu.



After you select a vendor and a particular connection, you will see its load graph:



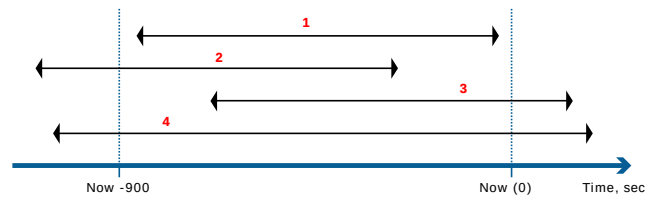
This graph shows the node load, setup time and ASR (Average Success Rate) statistics. The green area indicates node load, the red shows relative setup time, and the blue line indicates ASR. Information appears on this graph with a one hour delay.



Assumptions: Calls with a duration of more than 3,600 seconds are rare, and do not affect our statistics very much; zero duration calls need an average duration of 10 seconds to be processed by the router.

Connection load calculations

For a better understanding of the calculations performed, consider the following diagram:



The total duration must be calculated for all calls processed by the system corresponding to the interval between “now - 1 hour 15 minutes”, and “now - 1 hour”.

Four different call types are recognized in the above diagram; an additional call type is “zero duration”:

1. Sum of durations of all the calls.
2. Sum of durations between `t0` and `disconnect_time`.
3. Sum of durations between `connect_time` and `t1`.
4. Calculate sum as number of calls * 900 seconds.
5. Calculate sum as number of calls * 10 sec.

The maximum value in seconds which a connection can hold in the 900 sec. interval is calculated as $\text{capacity} * 900\text{sec}$. The connection load is calculated as the sum of durations for all call types divided by the maximum value in seconds. The result is shown as a percentage value (multiplied by 100).

ASR calculations

Assumption: Connection load less than 5% is not representative of ASR calculating.

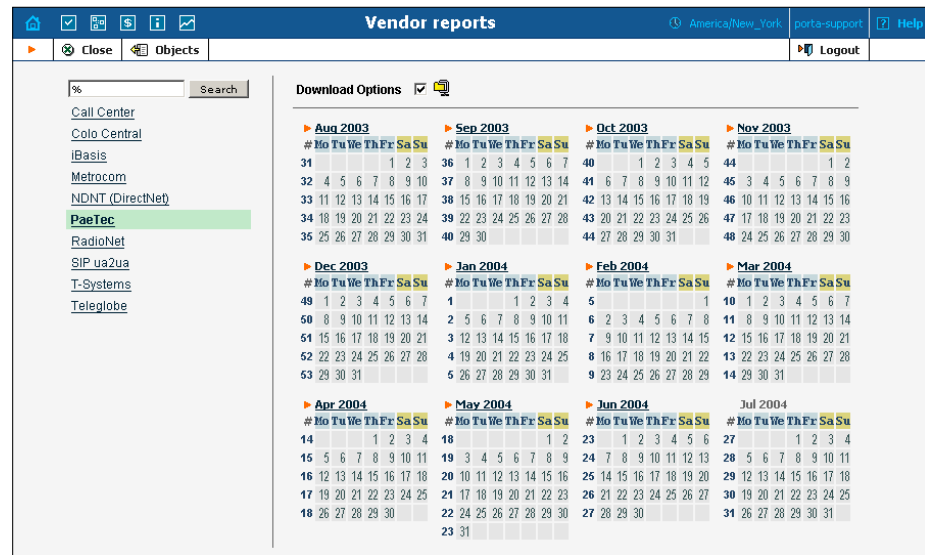
ASR is calculated as the number of type 5 calls divided by the total number of calls. The result is shown as a percentage value (multiplied by 100).

Relative setup time calculations

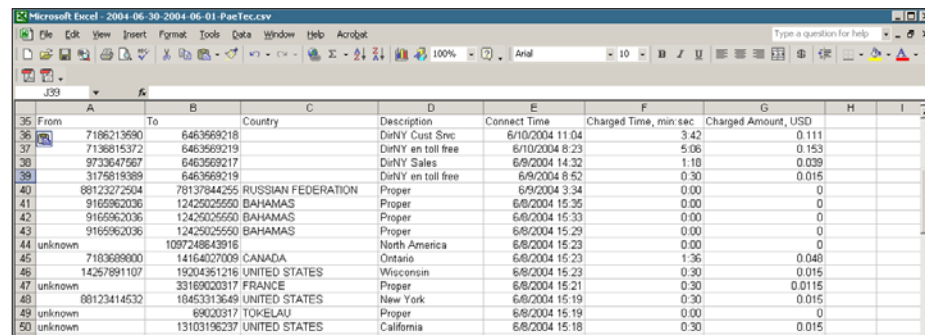
Relative setup time is calculated as the ratio between the total setup time of all calls during the given period and the maximum value in seconds ($\text{capacity} * 900\text{sec}$).

ASR statistics

Follow the **ASR** link from the **Statistics** section in the main menu.



You can download pre-calculated statistics in .CSV format (for previous days) or obtain data online using **Custom Query**. For pre-calculated statistics, click on the vendor at left, then choose the statistics period from the calendar. Pre-calculated statistics will look like the following:



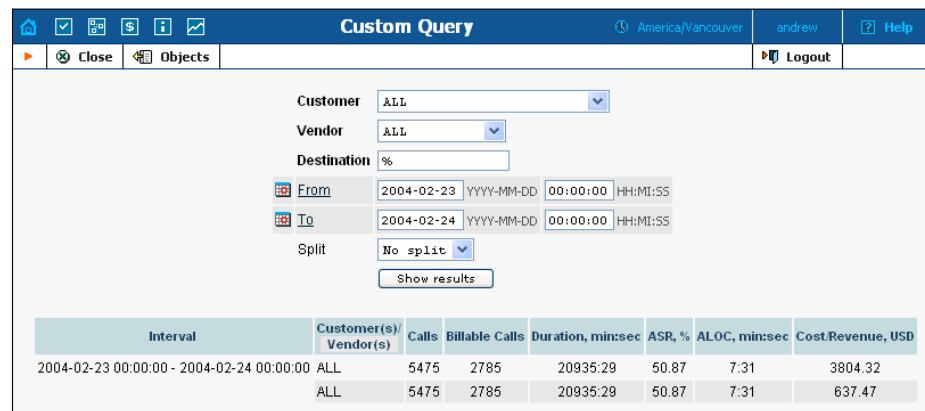
	From	To	Country	Description	Connect Time	Charged Time, min-sec	Charged Amount, USD
36	7186213590	6483569218		DirNY Cust Src	6/10/2004 11:04	3.42	0.111
37	7136815372	6483569219		DirNY en toll free	6/10/2004 8:23	5.06	0.153
38	9733647567	6483569217		DirNY Sales	6/9/2004 14:32	1.10	0.039
39	3175819389	6483569219		DirNY en toll free	6/9/2004 8:52	0.30	0.015
40	88123272504	78137844255	RUSSIAN FEDERATION	Proper	6/9/2004 3:34	0.00	0
41	9165962036	12425025550	BAHAMAS	Proper	6/8/2004 15:35	0.00	0
42	9165962036	12425025550	BAHAMAS	Proper	6/8/2004 15:33	0.00	0
43	9165962036	12425025550	BAHAMAS	Proper	6/8/2004 15:29	0.00	0
44	unknown	109724843916		North America	6/8/2004 15:23	0.00	0
45	7183699000	14164027009	CANADA	Ontario	6/8/2004 15:23	1.36	0.040
46	14257891107	19204361216	UNITED STATES	Wisconsin	6/8/2004 15:23	0.30	0.015
47	unknown	33169020317	FRANCE	Proper	6/8/2004 15:21	0.30	0.0115
48	88123414532	18453313649	UNITED STATES	New York	6/8/2004 15:19	0.30	0.015
49	unknown	69020317	TOKELAU	Proper	6/8/2004 15:19	0.00	0
50	unknown	13103196237	UNITED STATES	California	6/8/2004 15:18	0.30	0.015

The following data is available:

- Total number of calls
- Number of calls with non-zero duration (billable calls)
- ASR
- Total call duration
- Average Length of Call (ALOC)

Numbers are aggregated per destination prefix, with a subtotal per country and a total for all calls.

Should you need statistics for today, or a report with certain other parameters (for example, divided by hour, so that you see how the ASR evolved during the day), you can use the **Custom query** report. This extracts data directly from the database, so use it with caution in order not to overload the server.



Interval	Customer(s)/Vendor(s)	Calls	Billable Calls	Duration, min:sec	ASR, %	ALOC, min:sec	Cost/Revenue, USD
2004-02-23 00:00:00 - 2004-02-24 00:00:00	ALL	5475	2785	20935:29	50.87	7:31	3804.32
	ALL	5475	2785	20935:29	50.87	7:31	637.47

Note that both ASR and Cost/Revenue parameters are shown on the **Custom Query** report.

Billing statistics

Customer CDRs

Lists of all customers' CDRs are calculated daily, and are split into files according to each customer's billing period. These pre-calculated statistics can be automatically mailed to the customer. They are also available for download by the customer on the self-care pages, and for your staff on the admin interface.

Different types of CDR files are available, depending on the type of customer:

CDR files for retail customers

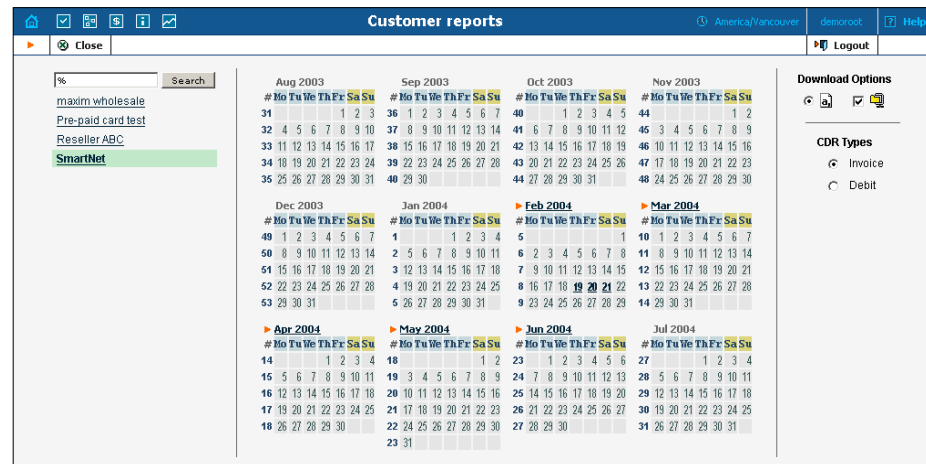
- **Invoice** – Calls made by credit accounts of this customer. These calls will be included on the customer's invoice for the corresponding billing period.
- **Debit** – Calls made by debit accounts of this customer. Since debit accounts are prepaid, calls made by them do not affect the customer's balance or invoice. Therefore, they are included in a separate file so that the customer can easily monitor activities on his debit accounts.

CDR files for resellers

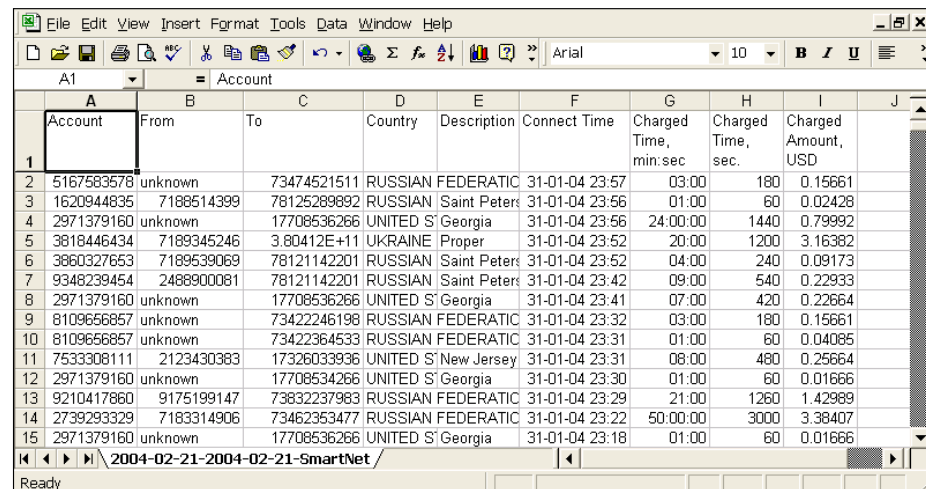
- **Wholesale** – CDRs calculated using the reseller's wholesale tariff. These are the charges applied to the reseller and reflected on his invoice.

- **Retail** – Calls made by an account of this customer and charged using the account's tariff. This allows a wholesale customer to monitor the charges applied to his accounts.

NOTE: Since there are now sub-customers under a reseller, with statistics for each of them calculated individually, statistics of this type are now obsolete. This item has been retained here only for backward compatibility, so that you can download statistics for earlier billing periods.



Choose the customer and then click on the calendar to obtain statistics for desired period. The .CSV file will have the following structure:



Account	From	To	Country	Description	Connect Time	Charged Time, min:sec	Charged Amount, USD
5167583578	unknown	73474521511	RUSSIAN FEDERATIC		31-01-04 23:57	03:00	180
1620944835	7188514399	78125289892	RUSSIAN	Saint Peter	31-01-04 23:56	01:00	60
2971379160	unknown	17708536266	UNITED S' Georgia		31-01-04 23:56	24:00:00	1440
3818446434	7189345246	3.80412E+11	UKRAINE	Proper	31-01-04 23:52	20:00	1200
3860327653	7189539069	78121142201	RUSSIAN	Saint Peter	31-01-04 23:52	04:00	240
9348239454	2488900081	78121142201	RUSSIAN	Saint Peter	31-01-04 23:42	09:00	540
2971379160	unknown	17708536266	UNITED S' Georgia		31-01-04 23:41	07:00	420
8109656857	unknown	73422246198	RUSSIAN FEDERATIC		31-01-04 23:32	03:00	180
8109656857	unknown	73422364533	RUSSIAN FEDERATIC		31-01-04 23:31	01:00	60
7533308111	2123430383	17326033936	UNITED S' New Jersey		31-01-04 23:31	08:00	480
2971379160	unknown	17708534266	UNITED S' Georgia		31-01-04 23:30	01:00	60
9210417860	9175199147	73832237983	RUSSIAN FEDERATIC		31-01-04 23:29	21:00	1260
2739293329	7183314906	73462353477	RUSSIAN FEDERATIC		31-01-04 23:22	50:00:00	3000
2971379160	unknown	17708536266	UNITED S' Georgia		31-01-04 23:18	01:00	60

The following data is available:

- Account ID (if applicable; not available for a wholesale customer's CDRs, but available for his accounts' CDRs)
- CLI or ANI (From)
- CLD or DNIS (To)
- Country and description of destination

- Call start time
- Charged time (in minutes:seconds)

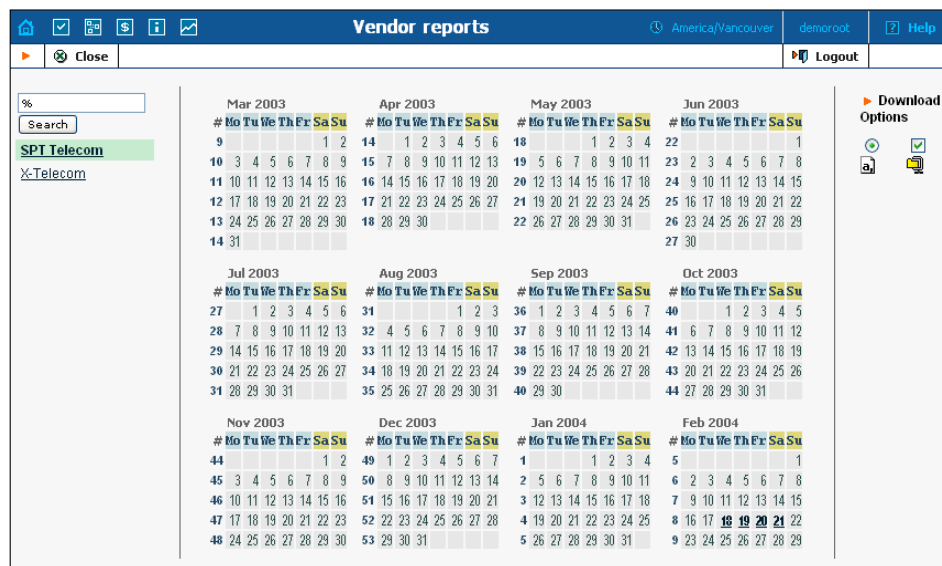
NOTE: When browsing data in Microsoft Excel, extra trailing zeros might be added, for example **345:37** (three hundred forty-five minutes and thirty-seven seconds) will be shown as **345:37:00**. Use proper call formatting in Excel to eliminate this problem.

- Charged time (in seconds)
- Charged amount

NOTE: The call duration shown in the file is based on the charged duration of the call, not the actual call duration. So if, for instance, you bill by 6-second intervals, the total call duration will be higher than the actual duration of the calls.

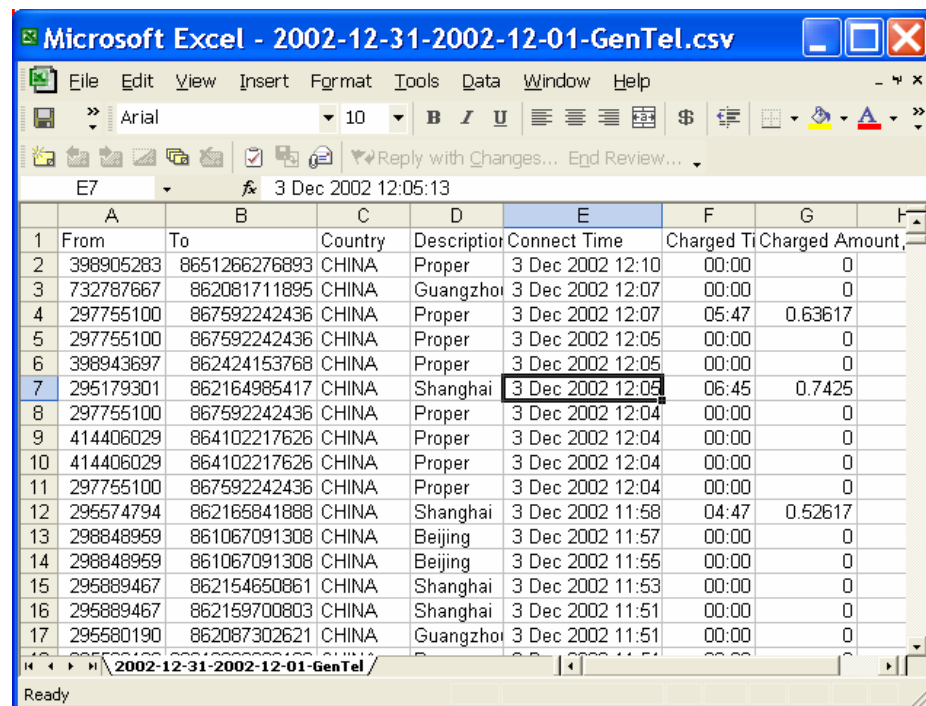
Vendor CDRs

It is very useful to have a detailed list of calls for a specific vendor, in case of disputes over the amount of terminated traffic. These statistics are calculated daily, and are split into files according to the vendor's billing period.



The screenshot displays the 'Vendor reports' interface. On the left, there is a search bar with a '%' symbol and a 'Search' button. Below it, a list of vendors is shown: 'SPT Telecom' (highlighted in green) and 'X-Telecom'. The main area features a calendar grid for the months of March 2003 through February 2004. Each month's calendar has columns for days of the week (Mo, Tu, We, Th, Fr, Sa, Su) and a grid of numbers representing the days of the month. Some numbers are highlighted in yellow. On the right side, there is a 'Download Options' section with a 'Download' button and a 'Help' icon.

Choose the vendor and then click on the calendar to download statistics for desired period. The .CSV file will have the following structure:



	A	B	C	D	E	F	G
	From	To	Country	Description	Connect Time	Charged Time	Charged Amount
1	398905283	8651266276893	CHINA	Proper	3 Dec 2002 12:10	00:00	0
2	732787667	862081711895	CHINA	Guangzhou	3 Dec 2002 12:07	00:00	0
3	297755100	867592242436	CHINA	Proper	3 Dec 2002 12:07	05:47	0.63617
4	297755100	867592242436	CHINA	Proper	3 Dec 2002 12:05	00:00	0
5	398943697	862424153768	CHINA	Proper	3 Dec 2002 12:05	00:00	0
6	295179301	862164985417	CHINA	Shanghai	3 Dec 2002 12:05	06:45	0.7425
7	297755100	867592242436	CHINA	Proper	3 Dec 2002 12:04	00:00	0
8	414406029	864102217626	CHINA	Proper	3 Dec 2002 12:04	00:00	0
9	414406029	864102217626	CHINA	Proper	3 Dec 2002 12:04	00:00	0
10	297755100	867592242436	CHINA	Proper	3 Dec 2002 12:04	00:00	0
11	295574794	862165841888	CHINA	Shanghai	3 Dec 2002 11:58	04:47	0.52617
12	298848959	861067091308	CHINA	Beijing	3 Dec 2002 11:57	00:00	0
13	298848959	861067091308	CHINA	Beijing	3 Dec 2002 11:55	00:00	0
14	295889467	862154650861	CHINA	Shanghai	3 Dec 2002 11:53	00:00	0
15	295889467	862159700803	CHINA	Shanghai	3 Dec 2002 11:51	00:00	0
16	295580190	862087302621	CHINA	Guangzhou	3 Dec 2002 11:51	00:00	0

The following data is available:

- CLI or ANI (From)
- CLD or DNIS (To)
- Country and description of destination
- Call start time
- Charged time
- Charged amount

Cost/Revenue statistics

These are essential tools for monitoring the growth of your business.

Working with different partners, different currencies and different prices, it is very easy to make mistakes and carry out non-profitable calls.

Cost/Revenue reports allow you to monitor this and stay out of trouble.

To access Cost/Revenue reports, follow the **Cost/Revenue reports** link from the **Statistics** section of the main menu.

Cost/Revenue reports											
America/Vancouver demoroot Help											
Close Custom Query Logout											
Inbound by Country											
Inbound by Customer											
Outbound by Country											
Outbound by Vendor											
Inbound											
Download Options											

There are five variants of pre-calculated reports:

- **Inbound by Country** – Information is split by customer and destination and sorted by country.
- **Inbound by Customer** – Information is split by customer and destination and sorted by customer.
- **Outbound by Country** – Information is split by vendor and destination and sorted by country.
- **Outbound by Vendor** – Information is split by vendor and destination and sorted by vendor.
- **Inbound** - Information is split by destination only.

File Edit View Insert Format Tools Data Window Help											
A1 = Customer											
A	B	C	D	E	F	G	H	I	J	K	
Customer	Destination	Country	Description	Calls	Gross margin, USD	Rated, sec.	Rated, min.	Total Cost, USD	Total Revenue, USD		
SmartNet	3741	ARMENIA	Yerevan	7	0.80521	839	13.983333	1.19768	2.00289		
SUBTOTAL				7	0.80521	839	13.983333	1.19768	2.00289		
SmartNet	61	AUSTRALIA	Proper	7	1.27417	8027	133.78333	3.05561	4.32978		
SmartNet	61404	AUSTRALIA		1	0.43478	369	6.15	0.98769	1.42247		
SUBTOTAL				8	1.70895	8396	139.93333	4.0433	5.75225		
SmartNet	43	AUSTRIA	Proper	8	2.35228	12856	214.26667	3.20971	5.56199		
SUBTOTAL				8	2.35228	12856	214.26667	3.20971	5.56199		
SmartNet	994	AZERBAIJAN	Proper	6	1.51933	1305	21.75	3.66377	5.1831		
SmartNet	99450	AZERBAIJAN	Mobile	1	0.18463	130	2.1666667	0.40983	0.59446		
SUBTOTAL				7	1.70396	1435	23.916667	4.0736	5.77756		
Pre-paid can	375	BELARUS	Proper	2	106.21	2126	35.433333	5.58076	111.7908		
SmartNet	375	BELARUS	Proper	20	11.2362	5279	87.983333	14.06189	25.29809		
Pre-paid can	37517	BELARUS	Minsk	1	-0.18254	517	8.6166667	1.70489	1.52235		
SmartNet	37517	BELARUS	Minsk	1	0.261	178	2.9666667	0.58698	0.84798		

The following data is available:

- Name of customer/vendor
- Destination prefix
- Country and description of destination

- Total number of successful calls
- Gross margin – the difference between total revenue and the cost for this destination
- Rated, sec. – the sum of the time charged for all calls to this destination in seconds
- Rated, min. – the sum of the time charged for all calls to this destination in minutes. This is the same value as in the previous column, only expressed in different units. Thus, for instance, if *Rated, sec* contains **180**, here **3.0** will be shown.
- Total Cost – the summary of the amount charged for all the vendor's CDRs for this destination. If the vendor uses a currency different than your base one, this will be converted using the current exchange rate.
- Total Revenue – the summary of the amount charged for all the customer's CDRs for this destination. If the customer uses a currency different than your base one, this will be converted using the current exchange rate. Note that, in the case of wholesale customers, we use the value of the customer's CDR, not the account's, since your revenue is what gets invoiced to the wholesale customer.

In addition, you can use the **Custom Query** report, which is identical to the **Custom Query** report in the ASR statistics.

6. How to ...

Charge my calling card customers XX/min extra when they call a toll-free line

This is very easy to do with PortaBilling's **Accessibility** feature:

1. Create two tariffs – one with your normal rates (for example 0.13 dollar/min for calls to Czech Republic) and the other one with “toll-free” rates, including your toll-free costs there (for example, 0.17 dollar/min for calls to Czech Republic).

TIP: When calculating the price for the toll-free line, it is not enough to add together your ordinary price plus the costs of one minute on the toll-free line. In order to make a 3-minute call, the customer will spend about 4 minutes on the line while listening to voice prompts, entering a PIN / destination and waiting for an answer. Additionally, situations where a customer will enter an incorrect PIN or be unable to reach his party at all should be taken into account. Therefore, usually:

$\text{TollFree\_Price} = \text{Ordinary\_Price} + X * \text{Toll\_FreeCost}$

where **X** is a ratio between the total duration of incoming toll-free calls and the total duration of outgoing calls.

2. Make sure your IVR script supports the “PortaBilling Original CLD feature”.
3. Create a product for your calling cards and make two entries in Accessibility:
 - one with a CLD equal to your toll-free number and “Toll-free tariff”
 - another with a CLD equal to your local access number and “Ordinary tariff”.

Authorize and bill my customers by the phone number they are calling from (ANI-based billing)

PortaBilling gives you great flexibility in choosing how you would like to authorize and bill your customers. For ANI-based billing, you only need to do the following:

1. Create a tariff (or tariffs) and a product.

Note: If you are providing both prepaid cards and ANI-based billing, take measures to prevent fraud (e.g., someone could dial your IVR and enter their neighbor's home

phone number as the PIN). When creating accessibility for the ANI-based billing product, separate it from prepaid cards by using a different access phone number, a different node, or different PIN lengths for the prepaid cards.

2. Use the corresponding application on your gateway to handle the call. You can use one of the default Cisco applications (clid_*) or create your own. The only important thing is that ANI (CLI) must be in the User-Name attribute in the AAA requests which go to the billing.

Cisco gateways usually have a number of ANI (CLI) authentication TCL scripts embedded into IOS. The application set may be slightly different on different platforms. The richest set available at the time of this writing is shown below.

```
Router#show call application voice summary
name          description
session       Basic app to do DID, or supply dialtone.
fax_hop_on    Script to talk to a fax redialer
clid_authen   Authenticate with (ani, dnis)
clid_authen_collect Authenticate with (ani, dnis), collect if that fails
clid_authen_npw Authenticate with (ani, NULL)
clid_authen_col_npw Authenticate with (ani, NULL), collect if that fails
clid_col_npw_3 Authenticate with (ani, NULL), and 3 tries collecting
clid_col_npw_npw Authenticate with (ani, NULL) and 3 tries without pw
DEFAULT       Default system session application
session.t.old  Session Application in TCL
fax_hop_on.t.old Script to talk to a fax redialer
clid_authen.t.old Authenticate with (ani, dnis)
clid_authen_collect.t.old Authenticate with (ani, dnis), collect if that fails
clid_authen_npw.t.old Authenticate with (ani, NULL)
clid_authen_col_npw.t.old Authenticate with (ani, NULL), collect if that fails
clid_col_npw_3.t.old Authenticate with (ani, NULL), and 3 tries collecting
clid_col_npw_npw.t.o Authenticate with (ani, NULL) and 3 tries without pw
prepaid       flash:debitcard.1.1.3.tcl
prepaid_v2    flash:app_debitcard.2.0.0.tcl
test_v1       flash:test_api_v1.tcl
test_v2       flash:test_api_v2.tcl
```

Use the clid_* application that corresponds to your authentication configuration, or develop your own. This is transparent from the billing point of view, as it uses ANI (CLI) as User-name. Here is a sample configuration:

```
aaa new-model
aaa authentication login h323 group radius
aaa authorization exec h323 group radius
aaa accounting connection h323 stop-only group radius
!
gw-accounting h323 vsa
!
dial-peer voice 1 pots
  application clid_authen_npw
  incoming called-number .
  port 1:D
!
gateway
```

!

3. Create a customer who will own these accounts.
4. Create accounts with an Account ID identical to the phone number from which the service is to be used.

TIP: Check in which format ANI (CLI) numbers are reported by your gateway. For example, the phone number +420 2 1234567 might be reported as “21234567”, “021234567”, “42021234567” or something different. You must use exactly the same format for the Account ID (or change your application so as to convert it to the desired format).

Bill customers who are connected via T1/E1 directly to a port on my gateway

Typically, you do not use authentication or authorization for such “port-based billing”, since you are always sure that your customer is on the other end of the physical line. Although it might be a good idea to implement call authorization so that you can control which destinations the customer is allowed to call to, we will not discuss this here. For port-based billing, you need only do the following:

1. For each such customer, create a tariff that you want to use to bill the customer and a product. Only one row in Accessibility is necessary, with the node “ANY” and the tariff you have created.
2. Now you must make sure that each call made by that customer is tagged as belonging to him. Use the corresponding application on your gateway to handle the call. You can use the Cisco application `app_session_name`, or create your own.

The often difficult part in gateway configuration is designing dial-peers to match certain voice ports. Dial-peers should resemble the following configuration:

```
dial-peer voice 1 pots
  application client_on_port_1
  direct-inward-dial
  port 1:D
```

They will be listed with an operation status of down, as the port specification must be accompanied by a number matching a specification, for example:

```
dial-peer voice 1 pots
  application client_on_port_1
  incoming called-number .
```

```
direct-inward-dial
port 1:D
```

This dial-peer is not adequate for our needs, because any number matching the specification will prefer the port specification, i.e. this dial-peer will match any port. The solution is to use a number-matching scheme that will not match any number.

```
dial-peer voice 1 pots
  application client_on_port_1
  incoming called-number A
  direct-inward-dial
  port 1:D
```

This solution may be considered a “hack”, yet it is functional and secure. For increased security, you may specify a 32-character string with a random sequence of “ABCD” characters. The probability of receiving such a number is near zero. So the configuration should look as follows:

```
aaa new-model
aaa authentication login h323 group radius
aaa authorization exec h323 group radius
aaa accounting connection h323 stop-only group radius
!
call application voice client_on_port_1
flash:app_session_name.2.1.0.tcl
call application voice client_on_port_1 user-name abc_ltd
!
call application voice client_on_port_2
flash:app_session_name.2.1.0.tcl
call application voice client_on_port_2 user-name xyz_inc
!
gw-accounting h323 vsa
!
dial-peer voice 1 pots
  application client_on_port_1
  incoming called-number A
  direct-inward-dial
  port 1:D
!
dial-peer voice 2 pots
  application client_on_port_2
  incoming called-number B
  direct-inward-dial
  port 2:D
!
gateway
!
```

1. Create customers who will own these accounts.
2. Create accounts with an Account ID identical to the name you entered in the configuration for the applications (**abc_ltd** and **xyz_inc** in our example).

Authenticate and bill my customers by the IP address of their gateway

This is another example of how easy it is to implement different billing schemes with PortaBilling. For IP-based billing, you just have to do the following:

1. Create a tariff and a product. Since “Node” and “CLD” only make sense for incoming telephony calls, set node to “ANY” and leave CLD blank for the IP-based billing product.
2. Use the corresponding application on your gateway to handle the call. You can use the Cisco application `remote_ip_authenticate`, or create your own. The only important thing is that the IP address of the remote GW be in the User-Name attribute in the AAA requests which will go to the billing. Here is a sample configuration:

```
aaa new-model
authentication login h323 group radius
aaa authorization exec h323 group radius
aaa accounting connection h323 stop-only group radius
!
gw-accounting h323 vsa
!
call application voice remote_ip
tftp://.../remote_ip_authenticate.1.1.1.tcl
!
dial-peer voice 11 voip
  application remote_ip
  incoming called-number .
!
```

3. Create a customer who will own these accounts.
4. Create accounts with an Account ID identical to the IP address of the remote gateway, and enter cisco as the VoIP password for this account.

Use volume-based billing

When you define a rate in a volume-based tariff and assign a volume lot to it, it will decrease with every call. Note that volume lot data is associated with a tariff, so that normally you will need a separate volume-based tariff for each of your volume-based customers.

When the volume lot parameter of the rate reaches zero, the rate will be marked as discontinued, so that some other rate (which has not been discontinued and has an **Effective From** date in the past) may be used

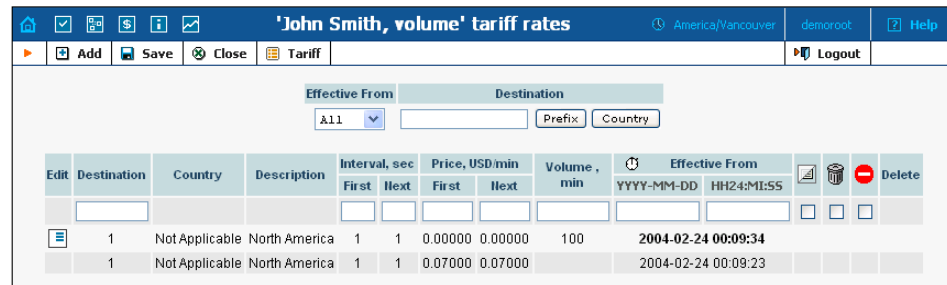
instead. Thus, some “normal” (non-volume-based) rates are usually first created in the tariff to define policy in the event that all the volume rates are used up. Let’s look at how to implement the most typical volume-based services.

Volume threshold

If you would like to give your customer 100 minutes of calls to US & Canada for free, and after that charge him 0.07/min:

1. Create a new volume-based tariff (choose **Volume Based** in the **Type** menu in the **Add tariff** form).
2. Enter the default rates. These rates should not be volume-based (keep the **Volume Time** column empty); rather, these are the rates to be used when the volume lot has been used up. Thus, in our example, we will enter a rate for destination **1** with a price of 0.07/min.
3. Now create another rate for prefix **1**. This rate will be volume-based, thus we enter **100** in the **Volume Time**.

The volume-based rate we have created will now be effective, so if a call is made to the US or Canada, it will be subtracted from the volume lot, but will not affect the customer’s balance. This will continue until all of the 100 minutes are used up. After that, this rate will be discontinued and, if another call is made, it will be charged according to the 0.07 rate, and so will be reflected in the customer’s balance.



The screenshot shows a web application interface for managing tariffs. The title bar reads "'John Smith, volume' tariff rates". Below the title bar are buttons for 'Add', 'Save', 'Close', and 'Tariff'. On the right, there are links for 'America/Vancouver', 'demoroot', and 'Help', along with a 'Logout' button. The main content area features a table with columns: Edit, Destination, Country, Description, Interval, sec (First, Next), Price, USD/min (First, Next), Volume, min, Effective From (YYYY-MM-DD HH24:MI:SS), and Delete. The table contains two rows of data:

Edit	Destination	Country	Description	Interval, sec	First	Next	Price, USD/min	First	Next	Volume, min	Effective From	Delete
	1	Not Applicable	North America	1	1		0.00000	0.00000		100	2004-02-24 00:09:34	
	1	Not Applicable	North America	1	1		0.07000	0.07000			2004-02-24 00:09:23	

If the customer is to receive more prepaid minutes, you will simply create another volume-based rate. Or, if you wish to give him 100 minutes every month, simply create volume rates for 100 minutes effective from the 1st of February, the 1st of March, and so on.

Wholesale volume lot

Let us suppose a customer buys 50,000 minutes from you to the Czech Republic and 30,000 minutes to Prague. Since he has prepaid you for these minutes, you want to make sure that, as soon as his lot to the given destination is used up, no further service is provided.

1. Create a new volume-based tariff (choose **Volume Based** in the **Type** menu in the **Add tariff** form).
2. Enter the default rates. These rates should not be volume-based (keep the **Volume Time** column empty); rather, these are the rates to be used when the volume lot has been used up. So, in our example, we will enter the rate for destinations **420** and **4202**, marking them **Forbidden**.
3. Now create a rate for prefix **420** with volume lot 50,000 and a rate for prefix **4202** with volume lot 30,000.

Now the customer can make calls to both the Czech Republic and Prague. If he tries to call **4202123456** and his lot for Prague is used up, the **Forbidden** rate will be applied during authorization, thus the call will be rejected. At the same time, however, he can still call the rest of the Czech Republic.

'ABC - volume based' tariff rates											
Home Check Print Save Close Tariff Logout Help											
Effective From Destination All Prefix Country											
Edit	Destination	Country	Description	Interval, sec		Price, USD min		Volume, min	Effective From		Delete
				First	Next	First	Next		YYYY-MM-DD	HH24:MI:SS	
	420	CZECH REPUBLIC	Prague	1	1	0.00000	0.00000	50000	2004-02-24 00:04:11		
	420	CZECH REPUBLIC	Prague	1	1	0.00000	0.00000		2004-02-24 00:00:47		
	4202	CZECH REPUBLIC	Prague	1	1	0.00000	0.00000	30000	2004-02-24 00:04:24		
	4202	CZECH REPUBLIC	Prague	1	1	0.00000	0.00000		2004-02-24 00:01:01		

Reliable cost/revenue figures when using volume-based billing

If, in addition to the volume lot, you want to include price parameters in the rate, this will not be used in creating a CDR for the customer, i.e. the customer's CDR will still show zero as the charged amount. It will, however, be used to calculate your estimated revenue, and will be stored in the vendor's CDR so it can be used for cost/revenue calculations. For example, suppose you sold a customer a volume lot of 50,000 minutes to Prague, Czech Republic, and he has now used it all up. If you created his volume-based rate with price 0, and your termination cost to the Czech Republic is 0.08/min, then your cost/revenue report will show -4,000, which is incorrect. However, if you configured your rate as shown below and entered an average price per minute, the cost/revenue statistics would show the actual figure of +1,500.



Charge reseller for incoming calls

A very common situation is that in which you provide the reseller with billing, gateways and other required components. When an end-user makes a call, you charge the reseller according to your wholesale rates. But now the reseller wishes to give his subscribers the ability to use either a local access line or a toll-free line. The reseller can use the accessibility feature to charge subscribers by different tariffs, depending on the access number. But what amount do you charge the reseller? Obviously, when somebody calls a toll-free line and then calls to China your cost is higher than when somebody calls a local access line and then calls the same number in China. This fact should be reflected in the reseller charges.

PortaBilling allows you to charge your reseller not just for outgoing calls, but also for incoming ones. This is done when the call crosses PSTN from the vendor connection. In order to implement this, follow these instructions:

1. Create a tariff which defines your incoming line costs.
2. Create a separate tariff which describes charges for incoming access numbers, and which you would like to apply to your reseller (for instance, incoming calls to 1800 numbers will cost your reseller 0.02/min, while calls to 1718 and 1206 numbers will be free).
3. Activate the “incoming charges” feature (disabled by default).
 - On the PortaBilling master, edit the `/home/porta-billing/etc/porta-billing.conf` and make sure the following line is present in the `[Features]` section:
`ChargeCustomerForIncomingCalls=yes`
 - On the PortaBilling slave, edit the `/home/porta-admin/etc/porta-admin.conf` and make sure the following line is present in the `[Customers]` section:
`ChargeCustomerForIncomingCalls=1`
4. Define a **PSTN from vendor** connection, which will describe the point where calls are delivered to your network from the vendor,

and therefore have costs associated with them. Associate the tariff created in step 1 with this connection.

5. Edit your reseller information. Now, on the **Additional Info** tab, you will see a new select menu – **Incoming tariff**. Choose the tariff you created in step 2, then click  **Save&Close**.

Now, when an account belonging to the reseller makes a call to the toll-free number 18001234567 (and there is a matching PSTN from the vendor connection), then makes an outgoing call to the Czech Republic (42021234567) and hangs up, the following charges will be applied:

- The account will be charged for an outgoing call to 42021234567 according to his rates to the Czech Republic; a CDR will be written to the database.
- For the vendor who terminated this call to the Czech Republic, a CDR will be written which describes your termination cost.
- For the vendor who provided the toll-free line, a CDR will be created which describes your incoming call cost.
- For the reseller, two CDRs will be created (and his balance will be modified accordingly):
 - for the call to 42021234567, according to his “outgoing” tariff (wholesale rates)
 - for the call to 18001234567, according to his “incoming” tariff.

Please note that these two calls will usually have a different duration. The incoming call will be longer, because the customer needs time to enter the prompts, wait to be connected, and so on. In this case you charge the reseller for the actual incoming call duration, i.e. exactly the same duration you are charged by the toll-free line vendor.

Deal with technical prefixes and numbering formats

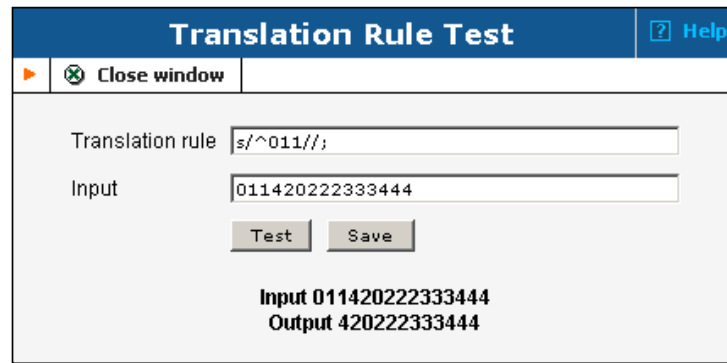
Different termination partners often require that you send them numbers in some specific format. For example, your termination partner might require usage of the technical prefix *58901#* (so you have to send him *58901#42021234567* instead of *42021234567*), while your local phone provider requires that outgoing call numbers be dialed without the country code (so a call to *42021234567* has to be dialed as *21234567*). The more partners you have, the more likely it is you will run into these problems with different numbering formats. Of course it is better to use a

single numbering format internally. Our recommendation is to use the E.164 format in billing and on your network. An E.164 compliant number is one consisting of *<countrycode><areacode><phone#>*. Examples of valid E.164 numbers are **42021234567** and **16049876543**. The following numbers are not valid E.164 numbers: 6049876543 (NANP format), 01142021234567 (US overseas dialing format), 021234567 (local format).

PortaBilling provides you with a powerful tool for converting all outside numbering formats into the unified format which is to be used in billing. For every connection to a vendor you can specify a translation rule that will convert the number into E.164 format. Here are some ready-to-use examples of translation rules:

- Convert NANP (North American Numbering Plan) phone number (area code + phone number, e.g. **604 888 7766**) into E.164:
s/^/1/;
- Convert European international dialing format (00 + country code + area code + phone number, e.g. **00 1 604 888 7766**) into E.164:
s/^00//;
- Convert North American international dialing format (011 + country code + area code + phone number, e.g. **011 1 604 888 7766**) into E.164:
s/^011//;
- Convert Australian international dialing format (0011 + country code + area code + phone number, e.g. **0011 1 604 888 7766**) into E.164:
s/^0011//;
- Convert tech prefix format (tech prefix + country code + area code + phone number, e.g. **6789# 1 604 888 7766**) into E.164:
s/^6789#//;
- Convert European domestic dialing format (0 + area code + phone number, e.g. **0 5 888 7766**) into E.164 (assuming that the country code is 44):
s/^0/44/;

Always test your translation rules before entering them into the billing. A special test window is available on the web interface. To access it, click on the test icon  next to the translation rule field.



Translation Rule Test		Help
Close window		
Translation rule	s/^011//;	
Input	011420222333444	
Test Save		
Input 011420222333444 Output 420222333444		

This will enable you to check if your translation rule has the proper syntax, and you can also immediately see if it performs the translation you need.

Locate h323-conf-id for a call

Unique call IDs are extremely important for troubleshooting. They allow you locate a call in the database and find call information in the billing engine logs or RADIUS detail files. Finally (and this is the most important thing), when reporting call problems to the PortaOne Support team or your business partner, a call ID helps to prevent confusion and allows the problem to be solved quickly.

In order to find the h323-conf-id for a call, do the following:

1. From the main menu, go to **Trace Call**.
2. Using the CLD and from/to date filters, make sure the required call is shown in the list of calls on the screen.
3. In the row containing call information, click on the  **View** icon (far left column). You will be shown detailed information about the call.
4. The first field on the screen should be the h323-conf-id, which is a combination of four hexadecimal numbers separated by spaces, e.g. 5FF7F6D1 715E02C6 A40990F3 C823E27E.

Troubleshoot incorrectly billed call

1. Make sure that someone in your organization is subscribed to the PortaBilling mail alerts (especially “Missing critical information”). This will help you to detect problems early.
2. Find the h323-conf-id for this call. This is a unique ID (a string of four hex numbers) generated by the gateway when the call was started, which will help you to exactly identify

this particular call among all the others. You can find this ID by doing one of the following:

- Looking at the statistics on your gateway.
 - Going to the radius details directory (`/var/log/radacc`), entering the subdirectory for the corresponding gateway, and using a program like `more` or `less` to browse the file. You can search by the number you dialed or account (PIN) number, or just browse the records near the end of the file.
 - Browsing the PortaBilling log (`/var/log/porta-billing.log`) for the number you dialed, account (PIN) number, or just browsing the records near the end of the file.
3. Look in the PortaBilling log (`/var/log/porta-billing.log`) or use **View logs** on the web interface to find all of the information about call processing there.

Note: Normally we receive information about each of the call legs separately, so it is necessary that you check the log entry regarding the processing of **all** call legs and the final call clean-up.

4. The following are typical error situations:
- **Call was not billed at all.** It was considered an “on-net” call, because we did not detect that it went to any of the vendors. Check that you have correctly defined connections to your vendors.
 - **Call was billed only to vendor, not to an account or customer** (and you received an email alert). The billing engine needs an Account ID in the User-Name attribute to correctly identify the account and customer. Check the logs to see what was in the User-Name attribute. Typical situations are:
 1. **Incorrect value in User-Name** (for example, phone number instead of IP address of the remote gateway). Cause: the required application was not used to handle the call. Remedy: check that the application is configured and associated with the corresponding *incoming* dial-peer.
 2. **On some of the call legs there is a correct value in the User-Name, while on others there is an IP address.** When a call is originated on gateway A and terminated on gateway B, then a “real” username appears only in the accounting from gateway A. In gateway’s B accounting the username will be the IP address of gateway A, because gateway

A had to authenticate itself before being able to make the call. This is a perfectly normal situation. PortaBilling recognizes this, and will replace a username identical to the node's ID (IP address) with a "real" username from the other call legs.

3. **Value in User-Name is correct, but reports "Did not find account/customer".** Check the accessibility for the account's product. It may be that, even if you have such an account, its accessibility is incorrect.
 - **Call was billed, but the phone number in the billing is incorrect (not in E.164 format) and there is a "Mismatch in rates or destinations" error.** Cause: missing or incorrect translation rule on connection to the vendor. Remedy: assign a translation rule; read the "Deal with technical prefixes and numbering formats" section.
 - **Call was billed and the phone number in the billing is correct, but there is a "Mismatch in rates or destinations" error.** Cause: missing rate for this phone prefix in the tariff. Remedy: create a rate for this destination in the tariff.
5. If you are unable to solve the problem by yourself, submit a problem report to support@portaone.com. Please make sure that you include the following in your email:
 - A detailed description of the call flow and what seems to be incorrect.
 - H323-conf-id of the call.
 - Relevant items from the `porta-billing.log`.

Create a custom TCL application

Sometimes you need a special call-handling or IVR functionality which is not available in the applications you already have. For example, you need a prepaid card IVR which will perform ANI authentication prior to PIN authentication.

First of all, check the TCL applications available as part of the Cisco TCLWare package, since what you are looking for (or something similar) is perhaps already there. If you find an application similar to what you need, you can use it as a template.



A productivity tool for TCL IVR development is available from PortaOne, Inc. **FastIVR** emulates Cisco with regard to script execution, TCL API, and VoIP-related IOS commands. You can find out more at:
<http://www.portaone.com/solutions/fastivr>

Make the 'Periodical payments' tab appear in the customer/account info

The Periodical payments tab will only be shown if the rest of the system is configured to accept payments. This requires:

- At least one payment system defined in the **Company Info** section.
- A payment system assigning the currency of this account or customer.
- For accounts, the **E-commerce enabled** flag must also be switched on.
- On the **Payment info** tab, the Preferred payment method must be set and information about the credit card entered.

For sub-customers or accounts belonging to sub-customers, the requirements are the same, except that the payment systems are defined in the reseller information, not in Company Info.

Prevent ANI number from being used as a PIN

The first method is the easiest one: use different gateways or access numbers for PIN-based and ANI services, and configure product accessibility accordingly. Thus even if a “hacker” calls your access number 12345 for prepaid cards and attempts to enter his neighbor’s phone number as a PIN, the call will not be authorized, since, although such an account exists, its product only allows usage with the access number 12346.

However, you might need to create an advanced service in which a single access number can be used for both ANI and PIN-based services. When the customer calls in, the system checks his ANI and, if the ANI is OK, it asks for a destination number. Otherwise, it gives the option of entering either a PIN or a phone number + password. In this case, you must prevent account misuse in a different way:

- ANI accounts should **always** be created with a non-empty VoIP password. Prepaid cards should be created with an empty VoIP password.
- Modify the TCL script, so that when the first authentication by ANI is done, the billing will receive User-Name=ANI and a special flag “skip password”. Thus, authentication will be successful if such an account exists, otherwise it will fail and the user will be prompted for a PIN.
- When a user enters a PIN, the PIN is provided in the User-Name, and the Password attribute is empty. The system checks for such an account, and since the password is empty for prepaid card VoIP, authentication is successful. If somebody tries to enter an ANI number as the PIN, authentication will fail because the password supplied does not match the one assigned to the account.
- If given the option “enter your registered phone number”, the user will then enter both his phone number and password (the latter is required to prevent unauthorized usage of his account), and both will be supplied to the billing. Authentication will be successful only if a correct account ID and password are provided.

Make a custom report from PortaBilling

PortaBilling provides you with an open data model. An ER-diagram of the database structure is not included in this document, but may be obtained from PortaOne, Inc. upon request. If you want to prepare custom reports on your workstation or a non-PortaBilling server, you will need to do the following:

- Make sure the remote computer has database drivers installed to access the PortaBilling database. Normally you would use native MySQL connectivity on Unix-based hosts and ODBC on Windows-based hosts.
- For any data-mining solutions (extracting data from the database), use **only** the slave database.
- Use a tool like Crystal Reports, Microsoft Access or some custom application to retrieve data from the database, process it and submit it to the user.

Use ODBC to connect to PortaBilling

ODBC (Open Database Connectivity) provides a way for client programs to access a wide range of databases or data sources. If you need extended customized reporting not available in PortaBilling, you can do this using external tools such as MS Access or Crystal Reports.

Create a MySQL user to be used for reports

1. Login into your Portabilling slave server using ssh.

2. Start the MySQL command tool.

```
andrew@demo:/home/porta-admin$mysql -u root mysql
Reading table information for completion of table and column
names
You can turn off this feature to get a quicker startup with
-A
```

```
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 42122 to server version: 4.0.17-
log
```

```
Type 'help;' or '\h' for help. Type '\c' to clear the
buffer.
```

```
mysql>
```

3. Create a new user using the GRANT command.

```
mysql> grant ALL PRIVILEGES on `porta-billing`.* to
'reports'@'192.168.0.5' identified by 'pod23uk';
Query OK, 0 rows affected (0.02 sec)
```

```
mysql>
```

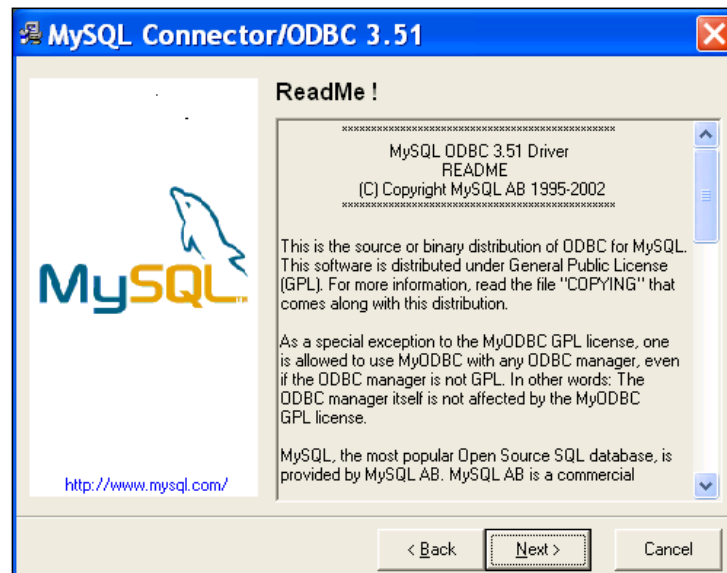
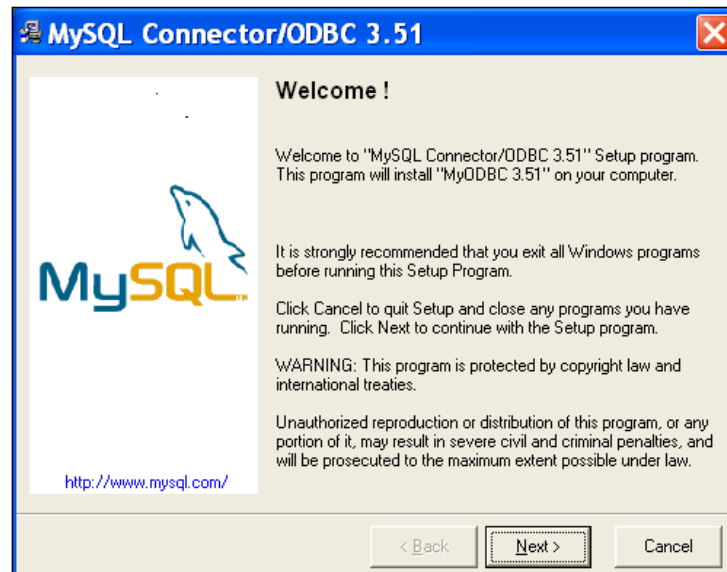
NOTE: The command above will permit access to all of the tables in the database. It is provided just as an example; modify it according to your actual needs.

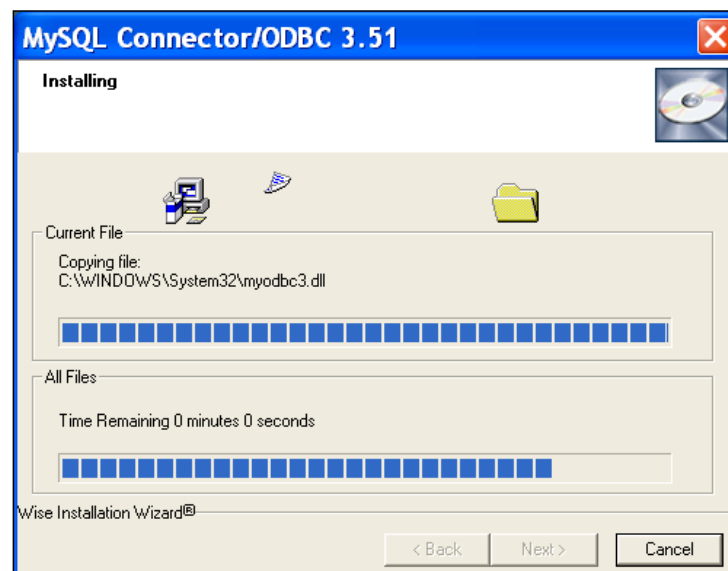
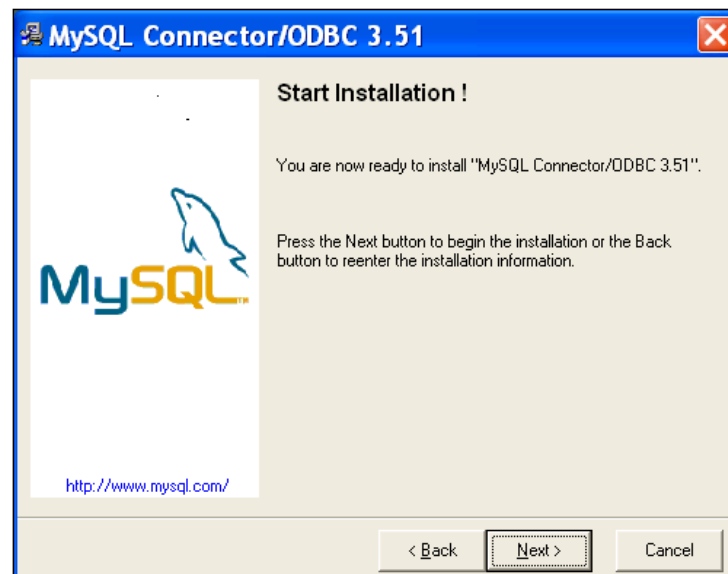
4. Flush the privileges.

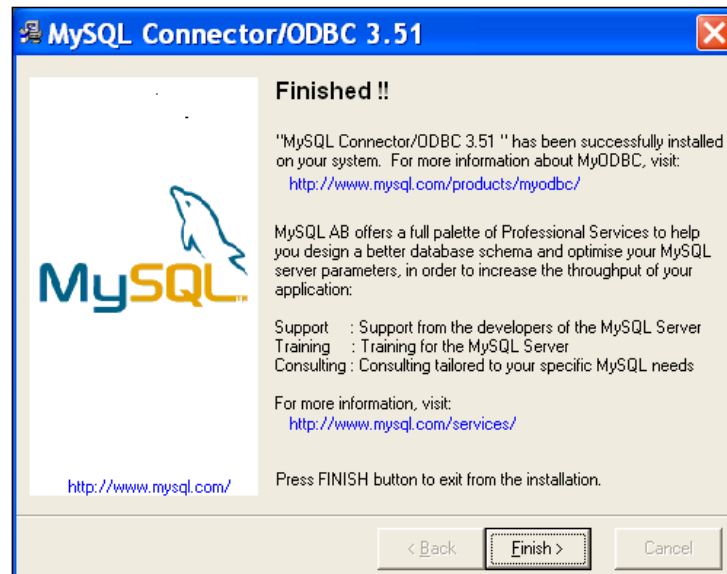
```
mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.07 sec)
```

Installing the MySQL ODBC driver

1. Download and run the installation package from:
<http://www.mysql.com>
2. Click **Next** on the information screens.







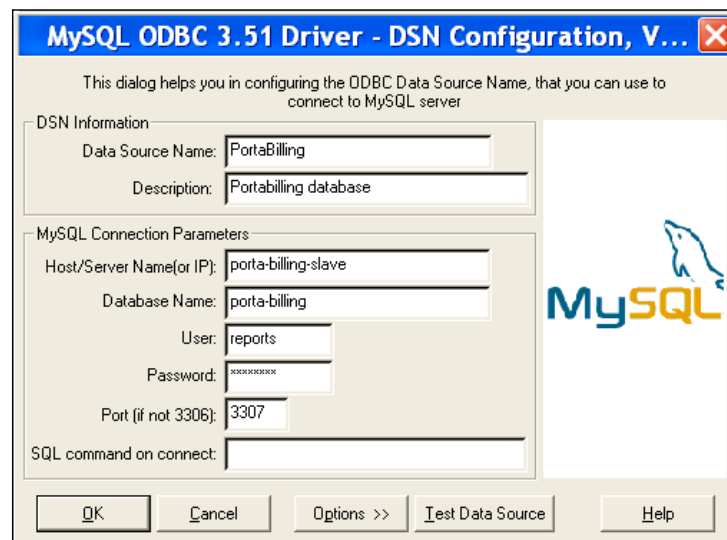
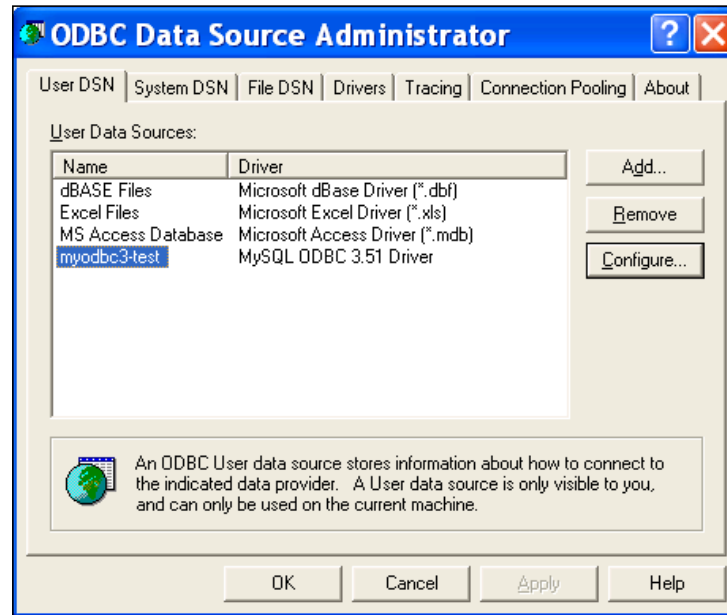
3. Click **Finish**.

Configuring ODBC

Before configuring the data source, create an MySQL user on slave DB with read-only permissions. Please examine the following document on how to add new user accounts to MySQL:

http://www.mysql.com/doc/en/Adding_users.html

1. Control panel -> Administrative tools -> Data sources (ODBC).
2. Select myodbc3-test and click **Configure...**. Fill in the configuration form.

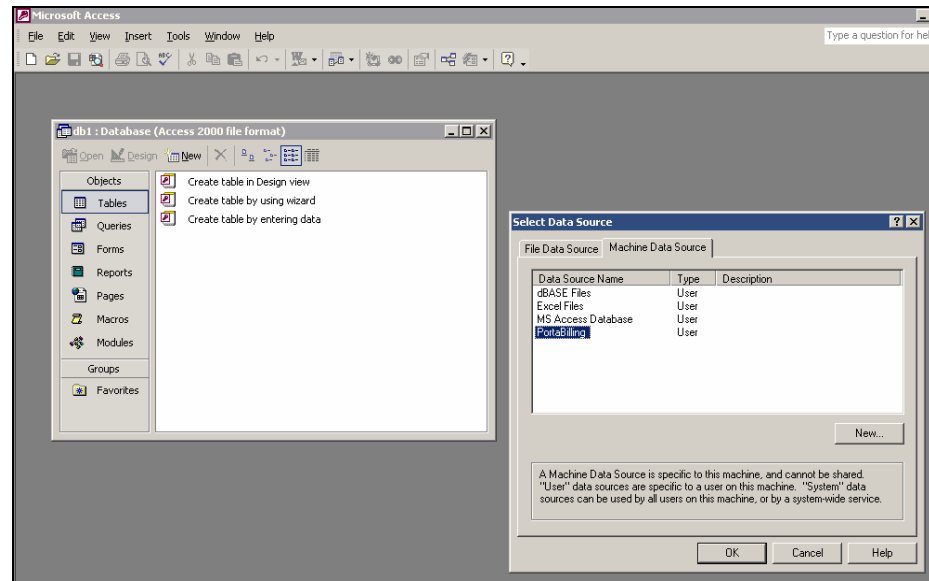


Important parameters include:

- **Host/Server Name (or IP)** – hostname (or IP address) of your slave server
- **Database Name** – porta-billing
- **User, Password** – username and password of the MySQL user you have created for reporting purposes
- **Port** – the port on which the database service is accessible; enter 3307 here

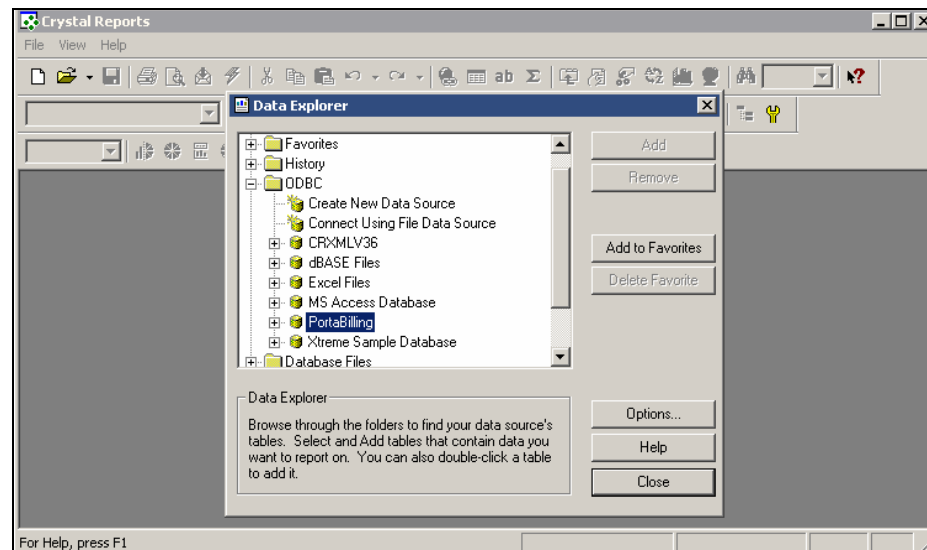
Note: This port number differs from the one used by default.

Using ODBC



In MS Access:

1. Create a blank database.
2. Right-click in the table design view, and choose **Link tables...**
3. Choose **ODBC databases** from “Files of type...” list.
4. Select **Machine data source**.
5. Select **PortaBilling** and click OK.
6. Select the desired tables.



In Crystal Reports:

1. Create a *New Report*.
2. In *Data Explorer*, open **ODBC** branch.
3. Select **PortaBilling**.
4. Select the desired tables.

Use redirect number feature

Each account in PortaBilling has a redirect number field. If this field is not empty, PortaBilling will include an h323-redirect-number in each authentication confirm message and use an h323-return-code of 52. How to proceed in this case is determined by the gateway. The account owner is allowed to modify the redirect number using the customer self-provisioning web.

There are no scripts for a redirect number functionality in the Cisco TCL package. You may wish to implement this functionality in-house, or Porta Software may be able to assist you.

Customer support number

PortaBilling allows you to enter the redirect number during the process of account generation so that you may specify different redirect numbers for different account batches. Different batches may be distributed in different regions, and only a slight modification to the prepaid card script will make it more intelligent in terms of choosing a customer support center.

IP telephony private line auto ringdown

In the case of a combination of ANI (CLI) authentication and immediate call forwarding, you may map phone lines from one world region to another. This is advantageous in that you will require only one local access number. Mapping is dependant on ANI (CLI).

Configure outgoing connection to vendor if sending calls using a gatekeeper, so that the remote IP address is not known in advance

In this situation, you clearly cannot use a **VoIP to Vendor** connection, since the IP address of the remote gateway will be assigned dynamically. The solution is to set up an IPIPGW and use it to send traffic to this vendor.

If you only have one such vendor whose termination IP address is unknown beforehand, and are sure that everything sent to the unknown IP address is going to this vendor, you can use a special feature in PortaBilling to handle this situation: create a “VoIP to Vendor” connection and enter **ANY** as the remote IP address. Any outgoing VoIP

call which goes neither to one of your trusted nodes nor any IP addresses explicitly defined in other connections will match this connection. If you have more than one such vendor whose remote IP is not known in advance, this method is no longer applicable. If you are using tech-prefixes, so that the phone number changes based on which carrier is being used (e.g. a call to 42021234567 will go to vendor A as 12345#42021234567, and to vendor B as 9876542021234567), you can use connection match by prefix. In the example above, enter **PREFIX:12345#** in the Remote IP field for the connection to vendor A, and **PREFIX:98765** for the connection to vendor B. Such a prefix connection will be matched only if the call does not go via a connection with a specific IP address or to a trusted node.

Force PortaBilling to disconnect after a customer calls over his credit limit

There is no need for PortaBilling to do this, as the gateway is able to by itself. When the gateway authorizes an account to make a call in PortaBilling, PortaBilling returns a maximum credit time (`h323-credit-time` RADIUS attribute) in the case of a successful authorization. When the gateway connects the call, it starts a timer; when the timer hits zero, it automatically disconnects the call.

Create accounts to be used for SIP services

There are no special requirements as to how such accounts should be created. You use the same interface to create and manage accounts for all services supported by PortaBilling (H323, SIP). Thereafter accounts can use H323, SIP or SIP & H323 services, depending on their product's accessibility. So if you plan for accounts with a certain product to be able to login to the SIP server and make outgoing calls, be sure to include the PortaSIP node with the appropriate tariff in the **Accessibility** for this product.

Integrate PB logins in your website

You can include the login form on your website using the following HTML code:

```
<form name=log method=post action=https://pb.mycompany.com/login.html>
  Login <input type="text" name="user" value="">
  Password <input type="password" name="password" value="">
```

```
<input type=button value="Login" onClick="submit()">
<input type=hidden name="redirectOnLoginError" value="www.myweb.com">
</form>
```

"redirectOnLoginError" - in case of unsuccessful login, PortaBilling will redirect the browser to the URL specified in the value attribute.

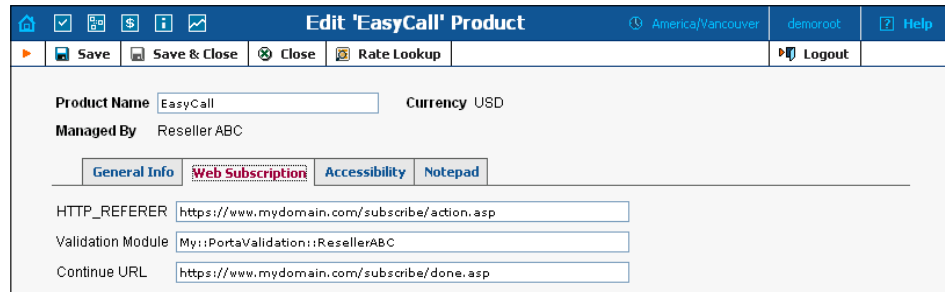
Configure online web signup

Typical steps for Web Subscription configuration:

- Decide where you are going to host your online web signup page. (This could be your corporate website, for instance.) Determine the URL of the page which will submit the request to create an account in PortaBilling. You will need to enter this in the "Subscription HTTP_REFERER" field. For instance, if your web signup page is running on:
<http://www.mydomain.com/subscribe.html>, then this is exactly what you should enter in the field. If your web signup portal consists of several pages or screens, you should enter the address of the last page, i.e. the one which contains the Submit button invoking the PortaBilling signup procedure. You will need an https server and a digital certificate in order to secure credit card transactions.
- Create a Web Subscription HTML form using the example provided with PortaBilling and put it on your web site. You can add or remove some fields in order to achieve the functionality you require, i.e. you may request that an account ID be entered if you are providing ANI-based service, or may not, if you are in the debit card business, and so on.
- In the configuration file of the web server:
/usr/local/etc/apache/porta.httpd.conf, uncomment the section about the virtual host for online signup; by default it runs on port 8500.
- Create a validation module or use the one provided with PortaBilling. By customizing the validation module, you can implement the advanced restrictions you require (e.g. allow creation of accounts with a balance of 10, 20 or 50 dollars only, or ensure that lifetime is no more than 180 days). Place this module somewhere on the web server so that it will be accessible for mod_perl; for example, in: /usr/local/lib/perl5/site_perl. Thus, if you decided to name your module: My::PortaValidation::ResellerABC, the actual program code would reside in:
/usr/local/lib/perl5/site_perl/My/PortaValidation/ResellerABC.pm

NOTE: Make sure that you restart the web server (apachectl restart) after making changes in the module.

- Create a reseller.
- Create a set of tariffs and products managed by this reseller.
- Fill in the form on the Product “Web Subscription” Tab.
- Login to the customer self-provisioning interface and enter the merchant account data (Company Info -> Merchant Account tab).



How it works:

- To start using your services, a user must go to your website and proceed to the online web signup page.
- Once the signup form is completed, the data will be posted to the PortaBilling server.
- After receiving the signup request, PortaBilling checks the HTTP header (provided by the customer's browser) and searches for a product with a matching "Subscription HTTP_REFERER", allowing further processing only if the host is found in the database. If not found, the transaction is rejected.
- PortaBilling associates the Subscription Host with the product for the account that is being created.
- PortaBilling will use the appropriate validation module to check if the supplied data are correct.
- The validation module will check the data, fill in any non-mandatory fields and return the data, along with the acquired status, to PortaBilling.
- If the status indicates an error, then registration is rejected and the browser is redirected using "Continue URL".
- If the status is OK, then PortaBilling proceeds with registration and executes the credit card transaction.
- If the status indicates an error, then registration is rejected and the browser is redirected using "Continue URL".
- If the status is OK, then PortaBilling creates an account and redirects the browser using "Continue URL".

- Each time the browser is redirected using “Continue URL”, PortaBilling provides a comprehensive set of parameters.

List of “Continue URL” parameters and possible values:

- status “OK”, “ERROR”
- message “CC rejected”
- session_id – unique session ID supplied by the web subscription server
- account_id – generated account ID

Sample files:

These can be found on your PortaBilling installation in the following directories:

```
~porta-admin/apache/subscription/subscription.html  
~porta-admin/apache/subscription/subscription_result.html  
~porta-admin/site_lib/Porta/Subscription.pm
```

An online web signup HTML form can be found at the following URL:

```
https://myPortaBilling.myCompany.com:8500/subscription.html
```

where myPortaBilling.myCompany.com is the URL of your PortaBilling Web Interface, and 8500 is the port on which the subscription virtual host is running.

7. Maintenance

Configuration files

There are two separate configuration files, one for the billing engine (master server) and one for the web interface (slave server).

Billing engine

The configuration file is called `porta-billing.conf` and is located in the `/home/porta-billing/etc` directory. It is automatically created by the installation program and populated with the initial configuration. You do not have to edit it unless you wish to alter the default behavior.

porta-billing.conf:

```
# Only full qualified email addresses, no local aliases please
#
[Global]
last_resort_email=admin@yourdomain.com
If a critical condition is detected (e.g. radius server is down) who should receive the
email alert.
email_header_from=porta-billing@yourdomain.com
What should appear in the From: field of email alerts.
Suspicious_Time_Threshold_sec=86400
Maximum acceptable difference in time sent by the gateway and current time on the
server. Default is 24 hours.
SQL_Trace=0
Whether all SQL queries and their results should be logged to the PortaBilling log file.
Use with caution, and only when a detailed debug is necessary, since this produces
huge log files.

[Master]
DSN=DBI:mysql:database=porta-billing
User=root
Password=xxxxxx
Connect parameters for the master database.
# Simultaneous login prevention for debit accounts
#
[Fraud_Detection]
Active=Yes
Turn the fraud protection on.
Test_Mode=No
Turn the fraud detection on. Debit accounts will be allowed to login more than once,
but an email alert will be sent.
Recovery_Time_sec=1800
After a debit account is successfully authenticated, how long should this information
should be kept in the memory? Default is 30 minutes. A longer recovery time will
increase the amount of memory required by the billing engine.
# Node IP Cache
#
[Node IP Cache]
Cache_Cleanup_Time_sec=600
How often information about nodes and connections should be updated from the
database. You can force nodes/connections to reload by sending a HUP signal to the
radius daemon.

# Email flood prevention.
#
[Email]
```

```
Max_Sequential_Emails=5
Look_Behind_sec=450
```

If the **Max_Sequential_Emails** in the **Look_Behind_sec** interval have already been sent, any extra email alert will be blocked. This is done to protect against email flooding.

```
Mail_Templates_Dir=Mail_Templates
```

```
# radcheck.pl
#
[Self Test]
Timeout_sec=5
Test_Frequency_sec=60
Errors_Before_Restart=3
Path_To_Lock_File=/var/run/radcheck.pid
NAS-IP-Address=127.0.0.1
Shared_Secret=SecretKey
User-Name=127.0.0.1
Password=cisco
```

This section defines parameters for the PortaBilling self-test suite. The script periodically sends an authentication request to the radius server, and expects a positive answer.

```
# radcheck.pl & porta-clients.pl
#
[Radius]
Host=127.0.0.1
Path_To_radius.sh=/home/porta-billing/radius_scripts/radius.sh
Path_To_Config=/var/db/raddb
Path_To_PID_File=/var/run/radiusd.pid
```

General parameters of the radius server required by the scripts as a self-check.

```
[Log]
# Where logs should go. Possible values are:
# Syslog, File and Console
Log_To=File
This writes a PortaBilling log to the file on disk. This is the default option, and normally
is sufficient for both production and debugging. Use other ways of logging only for
special debug purposes.
# For logging to file, give the filename.
# For logging to the syslog, give description in
# form of syslog:<facility>:<priority>
Log_Dest=/var/log/porta-billing.log
Path to log file. Default is: /var/log/porta-billing.log
#Log_Dest=syslog:daemon:warn
#NAS=13.232.103.106
#Username=0007777777
```

```
[Call_Cleanup]
Parameters in this section configure the lifetime of calls in the call cache.
Radius_Retransmits=5
Radius_Timeout=3
```

In order to know when we should no longer expect any packets, we need to know the maximum possible delay with which the request can be delivered to radius (the last possible retransmit).

```
Alive_Interval=60
```

If we bill by keep-alive requests, we need to know what is the interval between them.

```
Incoming_Session_Lifetime=10
```

Call lifetime after incoming call leg has been disconnected.

```
Default_Lifetime=120
```

Default lifetime of the call.

```
[Suggestions]
```

No_Remote_IP_Auth=no

Whether PortaBilling should warn you when it seems that your gateways are not authenticating incoming VoIP sessions.

Admin server and web interface

The configuration file is called `porta-admin.conf` and is located in the `/home/porta-admin/etc` directory. It is automatically created by the installation program and populated with the initial configuration. You might wish to edit it so that the system will better suit your needs.

porta-admin.conf:

[Global]

System_Name=MyBilling

Enter a distinctive name for your system here.

sendmail=/usr/sbin/sendmail

ZIP=/usr/local/bin/zip

UNZIP=/usr/local/bin/unzip

TempDir=/var/tmp/porta

maintainer=PortaBilling <porta-100@mybilling.com>

What should be in the **From:** field of outgoing emails.

Time_Zone=America/New_York

Default time zone (when creating new objects such as user, customer, etc.).

Debug=0

Check_Age=2

Pager=30

How many entries per page should be shown in tables. This is a master parameter, and can be altered for individual forms.

[Porta_Realm]

admin=443

accounts=8445

cc_staff=8446

customer=8444

Ports that different parts of the web interface are using.

[Master]

DSN=DBI:mysql:database=porta-billing;host=porta-billing-master

User=root

Password=xxxx

PrintError=1

Connect parameters for the master database.

[Slave]

DSN=DBI:mysql:database=porta-billing;mysql_socket=/tmp/mysql-slave.sock

User=root

Password=xxxxx

PrintError=1

Connect parameters for the slave database.

[Backup]

Keep=1

[X-Rates]

Max age (days)

Max_age = 60

```
Pager = 25
Base_Currency = USD

[Web]
# Login expiration (seconds)
Login_expire=172800
# Login expire if not used (seconds)
Passive_expire=86400

[Currency]
Pager = 25

# Default values for Card generator
Default values for "Account generator".
# Billing_model={Debit| Credit | Voucher}
# Preferred_language=<2-chars language name from iso-639-1>
[Cardissue]
Amount=1000
Balance=10
Life_time=90
Length=12
Default PIN length.
Billing_model=Debit
Preferred_language=en

# Default values for 'Add card manually'
# Billing_model={Debit| Credit | Voucher}
# Preferred_language=<2-chars language name from iso-639-1>
[Addcard]
Balance=0
Life_time=90
Batch=
Billing_model=Credit
Preferred_language=en

# Default values for Rates
# Pager Lines per page
# Cleanup_Interval -- interval for cleanup in days
[Rates]
Pager=50
Cleanup_Interval=90
How long old (not current) rates should be kept.

[CustomerWeb]
Pager=50
Interval=1

[AccountWeb]
Interval=1
Pager=50

[TraceCall]
Pager=50
Interval=1

[Invoice]
Pager=50
Interval=1

[Stats]
GrossMargin_Interval=1
# GrossMargin_Measure = day | month
GrossMargin_Measure=day
```

```
# GrossMargin_MaxAge = max age in days
GrossMargin_MaxAge=1000
ASR_days = 90
ASR_weeks = 52
ASR_month = 10

[RRD]
It is not recommended to change these parameters without a good grasp of RRD
principles.
Load_delay_seconds = 3600
Zero_call_length = 10
Load_delay_interval = 900
# % when ASR graph appears
ASR_Threshold = 5

[StatCalc]
Interval=0
Mask=%

[OnlinePayment]
PassFile=/home/porta-admin/etc/passphrase.txt
Encryption key for merchant account passwords.
Pager=25

[CDR]
How long CDRs should be kept in the database.
Keep_month=2
Keep_month_failed=2
```

Replication repair



For a better understanding of the following material it is highly recommended that you read the “Replication in MySQL” chapter at **[www.mysql.com](http://www.mysql.com/doc/R/e/Replication.html)**, or follow this link:
<http://www.mysql.com/doc/R/e/Replication.html>.

In the most common situation, recovering the replication process after a fault resembles setting up replication from scratch.

You should follow the instructions in the “How to Set up Replication” chapter of MySQL documentation. However, in our case the master database should not be stopped.

Let’s go through the procedure step by step:

1. Make sure slave database has stopped slave thread

Logon to the MySQL slave database using the `mysql` command. At the slave server shell command prompt, enter the following command:

```
mysql -uroot -p<mysql root password> porta-billing
```

After that you will see the `mysql` command prompt. Query the slave server status by entering this command:

```
show slave status;
```

MySQL displays a table with the status of the slave replication.

Important: You should see 'No' as a value in the 'Slave_Running' column. If You see 'Yes', stop the replication process by using this command:

```
slave stop;
```

2. Make a master database snapshot

The MySQL distribution provides a special tool for this: 'mysqlhotcopy'. To use this tool, logon to the master server and enter the following at the command prompt:

```
mysqlhotcopy --flushlog -u root -p <root password> porta-billing
```

After the program finishes running, you can find the `porta-billing_copy` database in your `mysql` data directory. Normally, the data directory is located at `/usr/local/var` or `/var/db/mysql`, but this may vary by installation. Consult your `mysql.conf` or system administrator if you are unsure.

You now have a fresh snapshot of your database.

3. Make a snapshot archive and copy it to slave server

As the `root` user, go to the `mysql` data directory. Enter the following command:

```
tar czvf porta-billing.tgz porta-billing_copy/
```

This creates an archive of the snapshot. Now it can be copied to the slave server. The best way of doing this is by using the secure copy tool 'scp':

```
scp porta-billing.tgz porta-admin@<slave server name>:
```



You will be prompted for the 'porta-admin' user password, and then the archive will be copied into the `porta-admin` user home directory on the slave server. When username and password are provided, the archive can be stored in any user's home directory. In a single-server configuration, the secure copy tool is not necessary. The regular copy command may be used instead.

4. Remember master binary logs position

Login to the master MySQL server and enter the command:

```
show master logs;
```

Remember the last `log_name` - you will need it to start replication on the slave server later.

5. Restoring database from archive on slave server

While logged in as 'root' on the slave server, unpack the archive file to the mysql data directory. To do this, simply `cd` to the mysql data dir and enter the command:

```
tar xvzf <path to>/porta-billing.tgz
```

If you used the `scp` copy command as described earlier, the `<path to>` may be replaced by the `~porta-admin`.

Delete the old database stored in `porta-billing` directory:

```
rm -rf porta-billing
```

and then rename the newly-created `porta-billing_copy` to `porta-billing`

```
mv porta-billing_copy porta-billing
```

Check the permissions on the unpacked files. Normally all files and the `porta-billing` directory must be owned by the 'mysql' user. In a single-server configuration, this will be the 'porta-admin' user.



Note: This procedure is not completely in agreement with MySQL documentation, which instructs the user to dump the whole database to sql statements and then restore it on the slave machine. Carrying out such an action on a production database with a large amount of traffic could result in significant latency.

Resume replication

Logon to the slave mysql server using the `mysql` command:

```
mysql -uroot -p<root password> porta-billing
```

Recall `log_name` from the previous step and use it in the following statement:

```
CHANGE MASTER TO MASTER_LOG_FILE='<log_name>',  
MASTER_LOG_POS=4;
```

At this point, the mysql server must be restarted for replication to continue. The following are the commands to stop and start mysql on a typical FreeBSD system:

```
/usr/local/etc/rc.d/mysql.server stop ;  
/usr/local/etc/rc.d/mysql.server start
```

On RedHat Linux systems the commands may be:

```
/usr/etc/init.d/mysql stop ; /usr/etc/init.d/mysql start
```

The location may vary depending on the operating system. If in doubt, ask your system administrator.

To ensure that replication has resumed, logon to the server and check the slave status:

```
show slave status;
```

In the second row of the 'Slave_Running' column you will see 'Yes'.